Submitted to:
US EPA Region 8
Denver, CO

Submitted by:
Atlantic Richfield Company
La Palma, CA
December 30, 2011

# 2011 Investigations, Analyses and Evaluations

## Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01
## Rico, Colorado

**Atlantic Richfield Company**

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December 30, 2011

***VIA AECOM FILE TRANSFER AND HAND DELIVERY***

Mr. Steven Way
On-Scene Coordinator
Emergency Response Program (8EPR-SA)
U.S. EPA Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

**RE: Submittal of 2011 Investigations, Analyses and Evaluations, Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado**
**EPA Unilateral Administrative Order, Docket No. CERCLA-08-2011-0005**

Dear Mr. Way:

A digital file in pdf format of the report titled 2011 Investigations, Analyses and Evaluations, Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado dated December 30, 2011 is being submitted to you today via the AECOM File Transfer system. You will receive an email from the system with a link to download the report. Three (3) hard copies of the report will be hand-delivered to your office no later than Wednesday, January 4.

Atlantic Richfield Company (AR) is submitting this report responsive to requirements in Subtask B3 – Pond Stability Analysis and Upgrades, Task C / Subtask 5.3.1.3 Supplemental Field Investigations and Laboratory Testing, and Subtask D1 – Adit Collapse Area Investigations of the Remedial Action Work Plan accompanying the Unilateral Administrative Order for Removal Action, Rico-Argentine Site, Dolores County, Colorado, U.S. EPA Region 8, Docket No. CERCLA-08-2011-0005.

If you have any questions or comments, please feel free to contact me at (714) 228-6770 or via e-mail at Anthony.Brown@bp.com.

Sincerely,

Anthony R. Brown

Tony Brown
Project Manager
Atlantic Richfield Company

Enclosure (2011 Investigations, Analyses and Evaluations)

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# 2011 Investigations, Analyses and Evaluations

# Rico-Argentine Mine Site – Rico Tunnels
# Operable Unit OU01
# Rico, Colorado

# EXECUTIVE SUMMARY

## ES 1.0 Objectives and Scope

This report presents the results of site investigations, laboratory testing and preliminary analyses and evaluations performed in 2011 in response to requirements in Subtask B3 – Pond Stability Analysis and Upgrades, Task C / Subtask 5.3.1.3 Supplemental Field Investigations and Laboratory Testing, and Subtask D1 – Adit Collapse Area Investigations of the Remedial Action Work Plan (Work Plan) accompanying the Unilateral Administrative Order for Removal Action, Rico-Argentine Site, Dolores County, Colorado, U.S. EPA Region 8, Docket No. CERCLA-08-2011-0005 (UAO). The location of the Rico-Argentine Site is shown on Figure ES 1.1.

The primary objectives of these studies were to:

1. Supplement existing information on the hydrologic, geologic and geotechnical conditions at the Site through a program of field exploration and laboratory testing;

2. Assess the hydrologic, hydraulic and structural adequacy of the existing flood dike (as defined below);

3. Assess the structural adequacy of the existing pond embankments (as defined below);

4. Identify interim measures if/as needed to enhance or stabilize the flood dike and pond embankments pending completion of final analyses, design and construction of permanent improvements;

5. Investigate conditions at the collapsed adit area of the St. Louis Tunnel; and

6. Identify key data gaps to be characterized in detail during winter 2012 and addressed by additional field investigations and laboratory testing during spring and summer 2012.

This report presents the results of studies performed during 2011. Conclusions and findings presented in this report are preliminary and subject to refinement based on additional focused investigations and testing to fill key data gaps and on forthcoming analyses as part of ongoing design under various Work Plan tasks.

## ES 2.0 Organization and Overview

This report is organized to address work performed that is responsive to several separate but related requirements under the Work Plan as described above. As a result, the report has been structured to include the following four largely stand-alone parts:

**Part A – Engineering Geologic and Geotechnical Field Investigations and Laboratory Testing**

**Part B – Hydrologic and Hydraulic Investigations, Analyses and Evaluations**

**Part C – Geotechnical Investigations, Analyses and Evaluations**

**Part D – Adit and Portal Investigation Report**

The objectives and content of these four parts of the report are described in this Section ES 2.0. Key findings and conclusions from these studies are presented in Section ES 3.0. Action items resulting from the investigations, analyses and evaluations reported herein are identified and described in Section ES 4.0.

**Part A** presents the results of field investigations and laboratory testing performed in 2011. The field investigations included: engineering geologic mapping; test pit excavation, logging and sampling; exploratory drilling, sampling and in situ testing; installation of monitoring wells in selected exploratory borings; cone penetrometer testing (CPT); and seismic refraction microtremor (ReMi) profiling.

Geotechnical laboratory tests performed included: moisture content; specific gravity; density; gradation; moisture-density relationship (i.e., Proctor testing); consolidation; unconfined compressive strength; and consolidated-undrained triaxial shear strength. The results of prior geotechnical field investigations and laboratory testing are also presented in Part A.

**Part B** presents the results of field investigations, laboratory testing, hydrologic and hydraulic analyses, riprap stability and scour analyses, and an assessment of the capacity of the flood dike at the Site to withstand a 100-year recurrence interval flood event on the Dolores River. For the purposes of this report, the flood dike is the north-south oriented riprap-armoured earthen embankment on the east bank of the Dolores River separating the St. Louis Ponds system to the east from the river.

Field investigations included: reconnaissance of the full length of the flood dike to assess overall condition and identify sites for more detailed field examination and documentation; photographing and videotaping the entire length of the flood dike; surveying field cross-sections at selected locations; estimation of riprap gradation at selected locations; excavation of riprap at test sites to examine riprap thickness, grading and the presence and character of riprap bedding; sampling of riprap bedding; and identifying any evidence of piping or seepage through the embankments. Geotechnical laboratory tests were performed to establish the gradation of apparent riprap bedding. Six reaches along the river were established by grouping similar embankment and riprap conditions.

Hydrologic analyses involved estimating the peak discharge of a 100-year recurrence interval flow event on the Dolores River in the reach adjacent to the St. Louis Ponds based on the 57-year record of measured flows at USGS Gage No. 09165000 located approximately one-half river mile downstream of the Site. Estimates of the 10-, 25- and 50-year recurrence events were also developed as potential bases for evaluation of short-term flood risk during construction at the Site.

Hydraulic analyses were performed to estimate the depth and velocity of flows throughout various identified reaches of the river adjacent to the flood dike as the bases for assessing the adequacy of the existing dike freeboard and riprap protection for each reach. Reaches where either freeboard or erosion protection were found inadequate were identified as critical reaches. Critical reaches were selected for design and construction of interim increases in dike crest elevation and/or erosion protection in spring 2012 pending final analyses, design and construction of long-term enhancements if/as needed.

**Part C** presents the results of geotechnical field investigations, laboratory testing, and preliminary analyses and evaluations specific to the flood dike and pond embankments. For the purposes of this report, pond embankments are the east-west oriented earthen embankments that together with the flood dike retain fluids and settled solids within the St. Louis Ponds. The objective of the preliminary analyses and evaluations performed and reported herein was to identify and characterize significant geotechnical deficiencies in the flood dike and/or pond embankments, if any, that require interim stabilization pending the completion of more detailed and comprehensive analyses, design and construction of long-term stabilization if/as needed under Task F of the Work Plan.

Those geotechnical field investigations and laboratory tests from the overall work reported in Part A that are directly relevant to the analyses and evaluations of the flood dike and pond embankments are referenced and discussed for their direct relevance to the analyses in Part C.

Preliminary analyses performed to date include long-term, steady seepage stability of the upstream and downstream slopes and foundations of the flood dike and pond embankments and susceptibility of the embankment gradations to internal instability due to seepage flows (i.e., internal piping). An evaluation of seismic stability of the flood dike and pond embankments and their foundations is underway and will be completed and reported later as part of Task F. This approach to the analyses and any associated final rehabilitation design and construction that may be indicated to address seismic loading is judged appropriate as the consequences of failure of the flood dike or a pond embankment are significantly diminished with the removal of solids from Pond 18 accomplished in 2011 and will be further reduced by the remaining removal of solids from Ponds 15, 14, 12 and 11 through 2013. Furthermore, the risk of a design earthquake event occurring at the site during the remaining relatively short period of exposure pending completion of Task F is judged sufficiently remote as to safely defer improvements that may be indicated (if any) to address seismic loading.

**Part D** presents the results of field and laboratory investigations performed to date at the St. Louis Tunnel (adit) portal and collapse area. The objective of these investigations was to characterize the geologic and geotechnical conditions of the existing collapse area, and to the extent feasible, identify and characterize the location where intact bedrock is encountered in the tunnel as a target for design and construction of hydraulic controls of the tunnel discharge and conveyance of the flows to treatment (assuming treatment at the ponds system is ultimately selected as an appropriate action under Task F).

The field investigations at the portal and collapse area included: engineering geologic mapping of the collapse area and adjacent hillside (as part of overall site engineering geologic mapping documented in Part A); detailed survey of exposed and accessible remnant tunnel supports as a basis for verifying the bearing and grade of the tunnel; sampling of colluvium in the collapse area for subsequent geotechnical testing; drilling of exploratory drill holes to investigate the nature and condition of the colluvium in the collapse area and to find the location and characterize the condition of in-place bedrock along the tunnel alignment; sampling of water and solids/sediments encountered within the tunnel; and installation of a pressure transducer within the lower reach of the tunnel to record hydraulic pressure as a function of seasonal flow stage.

Geotechnical laboratory testing to date has included gradation, plasticity and moisture-density relationship (i.e., Proctor) tests of colluvium from the steep excavated slopes at the site. Geochemical laboratory testing included analyses of selected relevant parameters for both groundwater and sludges/sediments encountered in the St. Louis Tunnel and sampled through drill hole AT-2.

# ES 3.0 Findings and Conclusions

Key findings and conclusions from the investigations, analyses and evaluations completed to date and reported herein are summarized by report part as follows:

## Part A– Engineering Geologic and Geotechnical Field Investigations and Laboratory Testing

1. The geology of the St. Louis Ponds portion of the Rico-Argentine Site is characterized by deep alluvial deposits underlying most of the area. The alluvium is typically coarser-grained (up to cobble and boulder size) in the upper few to tens of feet and finer-grained (predominantly silty sand) to depths up to at least 100 feet.

2. The steep slope at the eastern margin of the Site (CHC Hill) is characterized by a mantle of deep colluvial and landslide deposits overlying locally outcropping sedimentary Hermosa Formation bedrock; the Hermosa Formation is locally intruded by igneous dikes and sills. The portion of CHC Hill flanking the northern part of the Site is underlain by a very large, deep older landslide deposit; a shallower portion of this old landslide mass within and immediately above the alternative North Stacked Repository site is currently active.

3. Embankment fills and various mine waste deposits are present overlying the alluvium in the valley portion of the Site and colluvium or landslide debris on the lower slopes of CHC Hill. Although the fills and mine wastes are typically not engineered and do not appear to have been placed and compacted to modern standards, the embankment fills retaining the upper ponds on-site have been in place for nearly 60 years and are still functional.

4. The moisture content, gradation and density of both the natural soils (alluvium and colluvium) and the embankment fill and mine wastes are highly variable. Densities of these deposits are typically medium dense, but locally grade both to loose and very dense. It is noteworthy that densities do not necessarily tend to increase with depth.

## Part B – Hydrologic and Hydraulic Investigations, Analyses and Evaluations

1. The recommended peak flow rate for the 100-year recurrence interval design flood event at the Site is 2,200 cfs based on analysis of the downstream USGS gage record. The estimated peak flow rate experienced by the existing flood dike based on the available downstream gage data is 1,660 cfs (75 percent of the design peak flow rate), representing approximately a 25-year recurrence interval event.

2. Freeboard (the distance between peak flood stage and the flood dike crest) exceeds the conservative design standard adopted for this study of three (3) feet from the

north end of the flood dike to approximately the upstream end of the dike along Pond 9; overtopping is predicted during the modeled 100-year flow event beginning at the upstream end of Pond 8.

3. Flow velocities in the modeled reach of the Dolores River associated with the 2,200 cfs peak flow rate average about 8 to 10 feet per second (fps) with local areas up to 12 fps.

4. The bank slope of the flood dike meets or exceeds the adopted standard of 1.5H:1V except for a reach of about 400 feet adjacent to Pond 18; it is believed that this reach may be over-steepened due to prior raising of the dike crest during which it is inferred that till was dumped on the riverside slope as part of a "downstream raise" of the crest.

5. Riprap size is adequate over much of the flood dike extent, but is or may be undersized in three reaches. The southernmost reach is at the outside of a bend in the channel and is definitely undersized; conditions along Pond 18 appear unfavorable, but dumped fill may obscure more suitable riprap; and the reach along the northern portion of the dike is calculated as inadequate for what is known to be the currently overly-conservative modeling of bank velocities.

6. The gradation, stone characteristics and thickness of the existing riprap slope protection are generally favorable except in relatively small, localized areas. In some reaches where riprap layer thickness is somewhat less than normally recommended, it is compensated by oversize stone dimensions.

7. The potential for significant toe scour in the river channel during the design flood event is dependent on the actual gradation and thickness of the apparent coarser-grained alluvial layer in this reach of the Dolores River. Under a "worst case" estimate scenario significant scour is predicted in the downstream reach noted also in item 5 above, locally along Pond 18, and in the northern reach where conservative bank velocities have been modeled to date.

## Part C – Geotechnical Investigations, Analyses and Evaluations

1. The flood dike and pond embankments and their alluvial foundations are comprised predominantly of granular soils ranging from fine sand to small boulders; fines content of samples of the embankment fill ranges from 12-42 percent. Flood dike and pond embankment fill is typically medium dense and in some localized areas loose; the underlying alluvium ranges from dense-very dense to medium dense, typically grading less dense with depth.

2. Global stability factors of safety for the west (riverside) slope of the flood dike under long-term static, steady seepage conditions meet or exceed the conservative criterion of $FS \geq 1.5$ at all six (6) sections analyzed.

3. Global stability factors of safety were calculated for the upstream and downstream slopes of each of the east-west pond embankments from Pond 5 through Pond 18 for a total of 16 slopes at eight (8) cross-section locations analyzed. Nine (9) of the 16 cases analyzed met a criterion of minimum $FS \geq 1.4$ for a conservative estimation of shear strength of $\phi' = 32°$, $c' = 0$. Applying a slightly less conservative shear

strength of $\phi' = 34°$, $c' = 50$ psf, only one (1) of 16 cases was still less than the FS = 1.4 criterion at FS = 1.24.

4. The flood dike and pond embankments fill appears to be internally stable against piping (internal erosion) based on available gradations. Exit gradients of seepage from the downstream toe area of what were judged the worst case locations were all less than 1.0 indicating resistance to heave or piping; however, the gradient in one case was estimated at 0.9 which is higher than desirable for the long term.

**Part D – Adit and Portal Investigation Report**

1. The St. Louis Tunnel adit collapse area is characterized by steep, at best metastable slopes in colluvium with blocks of rock up to at least eight (8) feet in one dimension.

2. Based on drill hole BAH-01, bedrock is present at tunnel grade approximately 300 feet upgradient from the existing portal structure; the sedimentary rock of the Hermosa Formation at this location is moderately to heavily jointed and fractured and locally faulted and sheared.

3. Colluvium (including raveled/sloughed material) is present over the tunnel crown in the upgradient approximately one-half of the overburden reach, ranging in thickness from a few feet to on the order of 30-40 feet thick over the estimated rock intercept at tunnel grade.

4. The tunnel is partially blocked by colluvial debris approximately 150 feet upgradient of the existing portal structure. What are inferred to be primarily settled, precipitated metal oxy-hydroxide sludges are present to a depth of approximately one (1) foot at a location about 100 feet upgradient of the tunnel blockage.

5. Water is present approximately nine (9) feet above the tunnel floor at the penetration by drill hole AT-2; this is approximately three (3) feet higher than the elevation at which water is seeping through the debris blockage approximately 100 feet downgradient. It is estimated that there may be on the order of 200,000-300,000 gallons (0.6-0.9 acre-feet) of water backed up 700-1000 feet into the St. Louis Tunnel upgradient of the blockage.

## ES 4.0 Action Items

The investigations, analyses and evaluations presented in this report related to the flood dike and pond embankments, permanent drying facility and solids repository, and the adit collapse area are the basis for upcoming action items including: 1) identifying work necessary to fill remaining data gaps related to key aspects of certain existing conditions for these site features; 2) completing and/or updating selected analyses and evaluations; and 3) designing and constructing interim flood dike stabilization measures. These action items are summarized as follows:

1. A supplement to the geotechnical Field Sampling Plan (FSP) dated August 25, 2011 will be prepared and submitted to EPA not later than March 1, 2012. The FSP Supplement will identify and characterize the key data gaps related to the project features noted above. It will then describe the focused additional field investigations and laboratory testing to fill those data gaps, including but not limited to: 1) the

geotechnical conditions at depth in the riverside slope of Pond 18; 2) exit seepage conditions at the Ponds 14/15 embankment; 3) shear strength and permeability of samples fabricated to represent existing pond embankment fill; 4) density of locally apparently loose alluvium in targeted more critical locations; and 5) location of the colluvium / rock interface and colluvium and rock conditions in the area of the St. Louis Tunnel / rock surface intercept and adjacent potential colluvial borrow area to the south.

2. Existing global static, steady seepage stability analyses of at least certain of the pond embankments will be refined and updated, and analyses of stability under more extreme loading cases (i.e., earthquake, flood) will be performed for the flood dike and the pond embankments based on the information derived from the additional field and laboratory investigations noted in item 1 above.

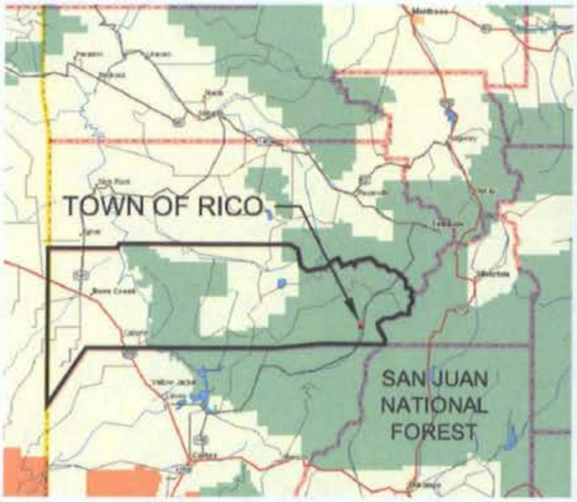
3. Further evaluation of anticipated bank velocities in the northern reach of the flood dike are underway to determine if interim and/or permanent improvements to the existing riprap slope protection are in fact required. The existing analyses and resulting estimated bank velocities are known to be conservative and these velocities are controlling the current conclusion that riprap size and channel scour protection may need to be enhanced in this reach.

4. Other conditions at selected locations along the flood dike are known to require interim measures including larger riprap, slope flattening and/or toe scour protection. A reach of the flood dike along Pond 9 needs to be raised to provide interim protection from flood overtopping (with adequate freeboard). Final analyses and design of these measures will be completed and presented in a Technical Memorandum to be submitted to EPA not later than March 1, 2012 in order to meet the requirement to finish construction of the interim stabilization measures by June 1, 2012.

Evaluation of water and solids sampled form the St. Louis Tunnel through drill hole AT-2 in 2011 (see Part D of this report), and additional sampling/analyses if/as appropriate from existing and new drill holes in the adit collapse area in 2012, will be performed as part of source control data collection under Task E. These investigations will be discussed and preliminarily scoped with EPA at a meeting currently proposed for January 26, 2012. Preliminary design of hydraulic controls and associated improvements at the adit collapse area will be addressed under Subtask D2 of the Work Plan and a Preliminary Design Report submitted to EPA not later than January 31, 2013.

**STATE OF COLORADO**

NOT TO SCALE



**DOLORES COUNTY**

NOT TO SCALE

**VICINITY MAP**

Scale: 1"=1000'

# RICO-ARGENTINE SITE - OU01

VICINITY MAP

FIGURE ES 1.1

AECOM

60157757

# PART A

## Engineering Geologic and Geotechnical Field Investigations and Laboratory Testing

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# 1.0 Purpose and Scope

## 1.1 Primary 2011 Engineering Geologic and Geotechnical Investigations

A program of field investigations and laboratory testing was performed in 2011 to provide data and information on site conditions in support of evaluations, analyses, designs, and construction required under various tasks in the Remedial Action Work Plan (Work Plan) for the Rico-Argentine Site (Site). Locations explored included: alternative locations for a treatment solids permanent drying facility and solids repository; the flood dike and pond embankments; the portal and adit collapse area at the St. Louis Tunnel (see also Part D); and potential on-site borrow areas.

The field investigations performed in 2011 included: aerial topographic mapping and ground surveys; preliminary engineering geologic mapping of approximately 155 acres at the Site; excavation, logging and sampling of 42 test pits totaling approximately 375 vertical feet of section explored; drilling, sampling and in situ testing of 34 exploratory borings totaling approximately 1450 lineal feet drilled; installation of monitoring wells in 6 selected exploratory borings and their adjacent paired holes (multiple depths); cone penetrometer testing (CPT) at 17 locations totaling approximately 590 lineal feet sounded; and six (6) seismic refraction microtremor (ReMi) lines totaling approximately 2340 lineal feet profiled.

Selected and representative samples acquired from exploratory test pits and borings during the field investigations were tested for selected geotechnical properties as discussed in Section 8.0. The results of this testing are summarized in Table 1.1A; the laboratory data sheets are included in Appendix A2. Samples of water and accumulated precipitated solids/sediment acquired from the St. Louis Tunnel through boring AT-2 were tested for appropriate suites of chemical analytes (see Section 5.2 in Part D and Appendix D1). Further interpretation of this testing and its implications will be incorporated in the ongoing evaluations of potential source control measures and the preliminary design of hydraulic controls under Work Plan Subtask D2 following additional investigations of the adit collapse area in the spring and early summer of 2012.

Work was completed in substantive accordance with the requirements and guidelines in the *Field Sampling Plan for Solids Repository, Permanent Drying Facility and Pond Flood Dike and Embankment Improvements* (Atlantic Richfield Company, 2011A). Each of these topics is discussed in the subsections below. The locations of all field explorations are shown on Figure 1.1A. Logs of test pits and borings are provided in Appendix A1; geotechnical laboratory test results are provided in Appendix A2; logs of the CPT tests are provided in Appendix A3; and the results of the ReMi surveys are illustrated on interpretive profiles presented in Appendix A4.

## 1.2 Other Ongoing Geotechnical Investigations

Sampling and geotechnical testing results associated with the removal of existing treatment solids form Pond 18 and their placement and drainage in the interim solids drying facility (constructed in the Pond 16/17 area), as described in *Technical Memorandum - Geotechnical Investigation of Pond 18 Treatment Solids Drying Behavior* (Atlantic Richfield Company, 2011B), that were available as of the submittal of this report are included in Appendix A2. Results of ongoing and future testing of the removal and interim management of existing treatment solids from the upper ponds at the Site will be periodically provided to

EPA as they become available, as will the results of attempted field infiltration testing conducted in Pond 18.

### 1.3 Prior Geologic / Geotechnical Investigations

Prior geologic / geotechnical exploration at the St. Louis Ponds portion of the Site and associated geotechnical laboratory testing are summarized in Section 9.0. The locations of the exploratory test pits, borings and monitoring wells are shown on Figure 1.1B. Logs of the test pits and borings are included in Appendix A1 and the associated geotechnical laboratory test results are summarized in Table 1.1B and lab data sheets are presented in Appendix A2.

## 2.0 Aerial Topographic Mapping and Ground Surveys

### 2.1 Aerial Topographic Mapping

A topographic map of the St. Louis Ponds and immediately adjacent ground was prepared by Olympus Aerial Surveys, Inc. (Olympus) of Salt Lake City, Utah based on aerial photography flown on August 8, 2011. Ground control for the aerial survey was set by Anderson Engineering Company, Inc. (AECI). Mapping was performed to meet National Map Accuracy Standards at two (2)-foot contour interval. Contours are shown dashed where accuracy of the mapping was unavoidably less due to thick tree cover on the steep slope east of the St. Louis Ponds.

### 2.2 Ground Surveys

Ground surveys were performed at various locations at the Site to support specific needs of various tasks under the Work Plan. This included cross-sections at selected locations on the flood dike as described in Part B and surveys of remnant tunnel supports in the adit collapse area as described in Part D. Where direct access was problematic, surveys were also performed using ground-based LIDAR at Pond 18 and the adjacent interim solids drying facility to document the surface of soft, wet treatment solids during key stages of the removal of solids from Pond 18 and placement of the solids in the interim drying facility. These surveys will be included in the future TM referenced in Section 1.2. Ground surveys of remnant exposed tunnel supports in the adit collapse area of the St. Louis Tunnel are discussed in Part D.

## 3.0 Engineering Geologic Mapping

A site reconnaissance was performed to identify and map surficial materials (such as fill, colluvium, and landslide deposits), and major bedrock units that occur in the vicinity of the project site. Prior to the field work, available published geologic mapping and reports were reviewed. The site geologic reconnaissance was performed by traversing the site on foot and mapping key geologic features, exposures and unit contacts on available topographic maps of the site and vicinity. The results of the geologic mapping are provided on Figure 3.1. A preliminary description and interpretation of the units mapped is provided in Section 10.0.

# 4.0 Exploratory Test Pitting and Drilling

## 4.1 Test Pitting

To complete the test pits, three different tracked excavators were utilized, depending on test pit location and accessibility. For the pond and flood dikes, where access was limited, a Caterpillar 308C CR "Mini-Excavator" was used to provide accessibility (Photo 4.1). For test pits within the ponds themselves, including Ponds 13 and 18, a Caterpillar 330C "Long-Stick" excavator was utilized to provide extended reach (Photo 4.2). For all other areas, a conventional Caterpillar 330C excavator was used (Photo 4.3).

Test pits were excavated to refusal or maximum safe reach depth of the excavator and logged by a professional geotechnical engineer in general accordance with guidelines in the *Engineering Geology Field Manual* (USBR, 2001). Pits were not entered in compliance with OSHA safety regulations, but pit walls and spoil piles were photographed and horizon depths estimated with a survey rod and/or marked excavator arm. Representative bulk samples were collected of each soil horizon in five gallon buckets (except minor horizons generally thinner than one (1) foot thick); moisture content samples were sealed separately in Ziploc bags. Samples were transported to the geotechnical laboratory for testing as described in Section 8.0.

## 4.2 Drilling

Drilling was accomplished with two sonic drill rigs from Boart-Longyear. Sonic drilling uses high-frequency, resonant energy to advance a core barrel and casing into subsurface soil units. The resonant energy is transferred down the drill string to the bit and rotates the drill string, distributing the energy and impact at the bit face. Sonic drilling is also able to penetrate through large cobbles and boulders so refusal is not typically an issue. The sonic drilling method advances a casing as the borehole is drilled, and produces a continuous core sample with typically high percent recovery. Core sample is retrieved and released into plastic sample bags, and a large amount of sample can be recovered and preserved at in-situ moisture contents

Where access was more difficult, including the pond dikes, a Boart-Longyear C-100 "mini-sonic" tracked sonic rig was used (Photo 4.4). For more accessible areas, a Boart-Longyear 600 C full sonic track rig was used. Both rigs are capable of drilling deep and penetrating the rocky soils on the site, including the shallow cobbly alluvium and colluvium. Both rigs were equipped to run Standard Penetration Tests (SPT) and for push and recovery of Shelby tube samples where soil conditions permitted. Note, however, that it was not feasible to flood the drill string with heavy drilling fluid to counteract otherwise unbalanced groundwater pressures that were encountered below the water table in several holes. This resulted in locally severe heave of unconsolidated, non-plastic soils into the core barrel so that reliable SPTs were not possible at those locations.

Boreholes were drilled to target depths or refusal as specified in the *Field Sampling Plan for Solids Repository, Permanent Drying Facility and Pond Flood Dike and Embankment Improvements* (Atlantic Richfield Company, 2011A) and logged by a professional geotechnical engineer or geologist in general accordance with the guidelines in the *Engineering Geology Field Manual* (Bureau of Reclamation, 1998/2001). The logs included information on: drilling equipment used; difficult or problematic conditions; depth of changes in horizons or materials encountered, including color, gradation, soil classification, plasticity, density or moisture; and other features such as roots, debris, fissures, voids, staining, etc. The depth to groundwater, if encountered, was also noted. Each sonic core sample was photographed or videotaped, and representative samples of core barrel or SPT recoveries were collected of each soil horizon (except minor horizons generally thinner than about one (1) foot thick) in sealed buckets or sample bags. Separate samples were collected and sealed in Ziploc plastic bags to preserve in situ moisture content. These samples were transported to the geotechnical laboratory for testing as described in Section 8.0. Shelby tube samples were capped and sealed with duct tape in the field and crated for transport to laboratory testing facilities.

In areas with pond dikes, Standard Penetration Tests (SPTs) and samples using a standard 2-inch OD split spoon and SPT method per ASTM D1568 were generally collected every 2.5 feet until alluvium was encountered, and then every five (5) feet to the bottom of hole or 30 feet in depth, whichever was shallower. In stacked repository and other areas, SPTs were generally collected every five feet as conditions permitted.

Selected boreholes were completed as monitoring wells as described in Section 5.0 or abandoned as noted on the logs. For monitoring well completions, standard 2-inch Schedule 40 PVC standpipe wells were installed utilizing 0.010-inch factory screened (slotted) intervals as noted on the logs. Boreholes not completed with piezometers were abandoned by filling to the ground surface with Halliburton Holeplug 3/8" bentonite pellets and adding water where necessary to hydrate the bentonite.

# 5.0 Monitoring Well Installation

A series of six paired monitoring wells (MW-1 through MW-6) were completed in or near the pond dikes to further characterize groundwater conditions at the Site. The well locations are shown on Figure 1.1A. At each location a deep "D" and shallow "S" completion were installed. The deep wells were logged, sampled, and completed as described in Section 4.0. The objective of the deep wells was to screen in the coarse alluvium underlying the ponds system to assess groundwater levels / hydraulic pressures in the alluvial aquifer present in the foundations of the dikes. The shallow wells were bored approximately five feet away from the deep wells and were completed in either the dike fill or in a unit above the alluvium to assess the hydraulic pressures and seepage characteristics of the dike or other unit as appropriate. Screened intervals (with additional buffer above and below) were backfilled with 20-40 Colorado Silica Sand and the remainder of the hole was backfilled with Halliburton Holeplug 3/8" bentonite pellets and hydrated. Monitoring wells were completed with concrete surface pads and locking well covers. After installation, the monitoring wells were developed using portable pumping equipment to flush cuttings and sediment from the screened interval to the extent practical.

# 6.0 Cone Penetrometer Testing

A total of 17 cone penetrometer test (CPT) probes (soundings) were completed at the site to provide additional geotechnical information on the softer and finer grain-size materials at the Site, including the calcines and finer-grained alluvial units that underlie the ponds. Based on the results of the exploratory drilling described previously in Section 4.2, the CPT program was expanded from the original probes of calcines in the Pond 16/17 area beneath the interim drying facility to include additional locations to recover further information on the finer-grained alluvial units beneath the pond system. CPT probes were completed by Gregg Drilling and Testing, Inc. using a Gregg 20-ton track mounted rig (Photo 6.1 and Photo 6.2).

Cone penetrometers measure the total penetration resistance to pushing a tool with a conical tip into the soil. A friction sleeve on the rod string measures the friction on the side of the string and aids in estimating soil cohesive strength. The CPT cone also employs a pressure transducer with a filter to gather pore water pressure data. This data is recorded in an electronic log by the operator. Logs of the CPT probes are presented in Appendix A3.

Cone penetrometer probes are typically suitable for silts, clays and fine granular materials but are typically unable to penetrate gravels, cobbles and boulders. To obtain results in the units of interest, most probe locations had to be pre-drilled through coarser (rockier) units or existing boreholes reused to access the target units. In cases where previously drilled boreholes were re-utilized such as CPT-ED-5, the probe was pushed through the bentonite backfilled interval installed (e.g., Borehole ED-5) as previously described in Section 5.0.

# 7.0 Seismic Refraction Microtremor (ReMi) Profiling

To supplement the results of test borings, physical properties of subsurface soils were evaluated within the Site by means of the ReMi test. This testing technique is designed to measure shear wave velocities of subsurface materials in a vertical profile with depth beneath a line of surface geophones. A key feature of the ReMi test is that the results are not adversely affected by the grain size of the soils. In this testing procedure, a series of 22 to 24 geophones were placed on the ground in arrays on 20-foot spacing in the approximate locations indicated on Figure 1.1A.

Six array locations (spreads) were used to evaluate conditions within this Site. Vibrations resulting from moving vehicles and other sources were employed to evaluate variations in subsurface strata. Data were recorded in 20 second sample intervals, with a two (2) millisecond sampling rate per channel. Once collected, the data were checked for their fidelity. To assure that a robust profile was being made, both individual recordings and multiple summed (stacked) recordings were evaluated.

A wave field transformation data processing technique, and an interactive Rayleigh-wave dispersion modeling tool were employed for the spectral analysis of surface waves. By analyzing segments of the geophysical line and integrating the results, two-dimensional profiles were developed along the seismic line arrays. The purpose of the two-dimensional profiles was to provide details of the shear wave velocities across the array length to depths of 100 feet. It should be noted that due to the nature of the analysis, it is not possible to interpret conditions at the extreme ends of the seismic array. As a consequence, the results omit the outer 50 feet of each array.

The results of the ReMi testing are discussed in Section 10.3 and interpretations of the data are presented on individual profiles that indicate variations in shear wave velocities along and below the ground surface along the length of the array by means of various colors. The resulting shear wave velocity model sections are presented in Appendix A4.

# 8.0 Geotechnical Laboratory Testing

Selected soil samples from the soil borings, monitoring wells and test pits were sent to Western Technologies, Inc. in Durango, Colorado, for index testing (moisture content, grain size and Atterberg Limits), in general conformance with the applicable ASTM/AASHTO standards. Bulk samples, mostly of the near-surface soils, were tested for Standard Proctor compaction parameters, relative to potential reuse as project fill. The results of the laboratory testing completed to date are summarized in Table 1.1A. Note that laboratory testing is ongoing, and therefore, the laboratory results presented in this report are a subset of the full 2011 laboratory testing suite. Outstanding laboratory testing is denoted by yellow highlighted cells in Table 1.1A. Results of the ongoing testing will be separately submitted to EPA upon completion and internal review.

Relatively undisturbed samples of drained solids from the bottom of Pond 18 were collected using the thin-wall Shelby tube sampling methods, then were sealed and shipped to AECOM's geotechnical laboratory in Vernon Hills, Illinois. The samples were tested for moisture content, specific gravity, unit weight, grain size, triaxial permeability, consolidation, laboratory vane shear and consolidated-undrained triaxial compression, in general conformance with the corresponding ASTM standards. The results of tests completed to date are included in Appendix A2. Applicable testing results are discussed and incorporated as appropriate in the analyses and evaluations presented in Parts B, C and D of this report.

# 9.0 Prior Geologic/Geotechnical Investigations

Geologic and geotechnical conditions at the St. Louis Ponds portion of the Site have been investigated by geologic reconnaissance and preliminary mapping, field exploration (including monitoring wells, exploratory borings and test pits), and limited geotechnical laboratory testing on a number of occasions from 1981 to 2008. This includes work performed by Dames and Moore (1981), Anderson Engineering Company, Inc. (AECI) (1996; 2008), Short Elliott Hendrickson Inc. (SEH) (2001; 2004), and Colorado Department of Public Health and Environment (CDPHE) (2003). The locations of these field explorations are shown on Figure 1.1B and test pit and boring logs are included in Appendix A1. These investigations were performed for a variety of specific purposes, to varying standards, and details of the work performed are only partially known. Where differing interpretations are possible utilizing this prior information as compared to the current (2011) information, greater weight is generally given to the more recent investigation results. As seen by review of Table 1.1B and the data in Appendix A2, there was very little geotechnical laboratory testing performed on samples from these prior investigations.

# 10.0 Summary of Preliminary Findings

Preliminary descriptions and interpretations of geologic and geotechnical conditions encountered in the site explorations and laboratory testing performed during 2011 for this study are presented in the following subsections. As summarized in Section ES 4.0 of the Executive Summary, additional carefully targeted field investigations and laboratory testing are planned to address data gaps that have been and/or will be found as work continues. The preliminary interpretations presented here will be refined and updated based on the ongoing work and will be reported to EPA as part of submittals under Task F of the Work Plan.

## 10.1 Overall Site Geology

### 10.1.1 Bedrock

Bedrock is largely covered in the valley bottom and on the hillslopes within the mapped area by unconsolidated surficial deposits described below (see Figure 3-1). A detailed description of the bedrock geology of the area is presented in McKnight (1974). Two principal bedrock types were delineated within the area: Precambrian greenstone (map symbol g), and Paleozoic Hermosa Formation (map symbol Phl).

The oldest rocks in the area are Precambrian age greenstones that are metamorphosed mafic igneous rocks. These mafic rocks only occur in a narrow, east-west belt that crosses the river near the highway bridge in the southern portion of the mapped area. According to McKnight (1974) the east-west belt of mafic rocks is actually an upthrusted fault block bounded by the Smelter Fault on the south and the Last Chance Fault on the north. The uplifted fault block occurs at the central axis of a broad structural feature known as the Rico Dome.

The lower member of the Paleozoic Hermosa Formation crops out as a discontinuous ledge in the slope on the east side of the valley. The Hermosa Formation is a thick sequence of interbedded sandstone, shale, conglomerate, limestone and dolomite that is the predominant geologic unit within the Rico District. The Hermosa Formation sequence is intruded by Tertiary-age igneous rocks that were not mapped separately. The intrusives are predominantly hornblende latite porphyry that occurs as a complex pattern of sills and dikes.

### 10.1.2 Landslide Deposits

Landslide deposits occur in the hillslope on the east side of the river valley in the northeast portion of the mapped area. The landslides deposits were classified based on the relative age of movement: active landslide deposits (map symbol Qlsa), and older landslide deposits (Qlso). Active or potentially active landslides (Qlsa) include slope failures that exhibit evidence of movement during last few years. Older landslide deposits are characterized by large, deep-seated landslide complexes that do not exhibit geomorphic or anthropomorphic (i.e., man-made) features suggestive of recent movement (last several decades).

An older extensive landslide deposit occurs in the northwest corner of the mapped area. This landslide deposit is part of much larger landslide complex that covers approximately one square mile in the CHC Hill area (see Figures 10.1A and 10.1B). This landslide, herein referred to as the CHC Hill landslide, was mapped and described in USGS reports for the area (Cross and Spencer, 1900; and McKnight, 1974). Immediately north of the site, westward movement of the CHC Hill landslide controls the position of the Dolores River (see Figure 10.1A). In this area, the river is confined between the toe of the landslide on the east and the base of Sandstone Mountain on the west.

A smaller active landslide (Qlsa) occurs in the north-eastern corner of the mapped area (Figure 3-1). This landslide has developed within the larger, deeper CHC Hill landslide and represents local reactivation of the toe of the larger ancient slide mass. The active slide extends approximately 500 feet from head to toe and ranges from 200 to 300 feet in width. This landslide exhibits evidence of recent slump and debris slide activity. The slide has a relatively fresh main headwall scarp, and fresh secondary minor scarps; and several slump block features in the upper portion of the slide; and active debris slide features in the lower portion of the slide mass (Photo 10.18). All of these features suggest that the slide is active and poses a high risk to any facility situated at the toe of the slope. The mechanism that triggered reactivation of the slide in this area is unknown. However, grading and excavation at the toe of the slope in this area may have contributed to slope destabilization and reactivation of a portion of the older slide mass.

A preliminary geologic reconnaissance was conducted in the central and upper portions of the CHC Hill landslide north and east of the mapped area. The purpose of the reconnaissance was to look for indications of recent movement of the larger, deeper landslide mass. Overall, the CHC landslide deposit located immediately east and upslope of the mapped area did not exhibit evidence of movement in the past several decades. Most of this area is densely vegetated with mature aspen and fir trees. It is also traversed by primitive dirt roads that have existed since the early 1900s. There is also a relatively large waste rock pile associated with the historic Mountain Springs Mine situated in the lower central portion of the slide. If the CHC Hill landslide had experienced significant movement in the past few decades one would expect to see geomorphic / anthropomorphic evidence such as disrupted vegetation, roadways, and mine waste piles situated in the central portion of the slide mass. None of these types of features were observed during the reconnaissance suggesting that the larger CHC Hill landslide has not experienced significant movement in the past several decades or more. There are, however, localized active landslide deposits within the CHC Hill landslide area (like the one described above in the project area) where localized portions of the slide have been reactivated. These were observed locally in the upper portion of the CHC Hill landslide.

It is likely that the primary deep-seated movement in the CHC Hill landslide originally formed under the wetter climatic conditions in the late Pleistocene. These older landslide deposits can become reactivated as the result of natural and human surface disturbance (e.g., clearing vegetation, excavating the toe of slopes, modifying the drainage pattern, or increasing groundwater levels).

### 10.1.3 Unconsolidated Surficial Deposits

Alluvium (map symbol Qal) (unconsolidated materials deposited by streams and rivers) occurs along the active Dolores River floodplain (see Figure 3-1). Alluvium consists of predominantly coarse-grained deposits of silt, sand, pebbles, cobbles and boulders up to a couple of feet in diameter. The rock clasts are of variable lithologies (i.e., rock types) and generally subrounded to well rounded in shape.

Colluvium (map symbol Qc) forms by the downslope movement of soil and rock on moderate to steep slopes under the influence of gravity and sheet flow processes. The slopes that bound the east side of the St. Louis Ponds area are generally covered by extensive colluvial deposits that conceal the underlying bedrock. The thickness of these deposits tends to increase in the lower portion of the slope where the colluvium accumulates as a wedge of material resting on the valley floor. The colluvium is covered by patchy soil and vegetation. The colluvium consists of a mixture of coarse talus and material accumulated by slope wash, soil creep, and shallow, localized landslide processes.

Most of the valley floor area situated east of the Dolores River is covered by various types of fill material or native materials that have been disturbed by grading. Alterations in the surface geomorphology were used to identify areas covered by several feet or more of fill or disturbed by grading. The fill deposits were classified into three primary types based on visual observations: Undifferentiated fill (map symbol F), mine waste (map symbol MW), and riprap (map symbol RR). Riprap occurs along two separate and distinct dike structures (i.e., earthen embankments) that separate the ponds area from the Dolores River. One of the dikes extends for approximately 1,100 feet and consists of angular boulder (map symbol RR1; referred to elsewhere in this report as the flood dike). The other dike extends only approximately 400 feet and only occurs in the northwest portion of the site. This dike consists of rounded boulders that appear to be derived locally from the river bed.

## 10.2 Geologic/Geotechnical Conditions at Key Site Areas

### 10.2.1 Flood Dike and Pond Embankments

Six (6) borings (ED-1 through ED-6), twenty three test pits and two (2) CPT probes were completed in the flood dike and pond embankments to support evaluations of foundation and slope stability, seepage conditions and piping potential. The dike fill is typically granular in nature, consisting of varying percentages of silty, clayey, sandy gravel with cobbles. Photo 10.1 shows a typical exposure of dike fill in a test pit excavation. Although the dike fill can contain various other materials such as oxidized waste rock and calcines, most of the material encountered was similar to that in the photo. Below the dike fill, the valley alluvium is present under the flood dike adjacent to the Dolores River and in the central portion of the ponds. Adjacent to the east hillside, the pond embankments tend typically to be founded on valley alluvium and/or colluvium.

A black organic silt alluvial layer (Photo 10.2) with root fragments is sometimes present beneath the dikes and appears to be a Dolores River overbank deposit. Where encountered this unit was typically less than two (2) feet thick. Beneath this layer, if present, or directly beneath the dike fill was a typically grey, black or brown coarse alluvial unit approximately 10 feet thick comprised of sand and gravel with an appreciable amount of cobbles. Previous hollow stem augering (HSA) and other drilling methods typically reached refusal on this layer due to the coarse gradation. Larger gravels, cobbles and scattered boulders are typically subrounded to rounded, but not uncommonly subangular. The coarse alluvium ranges from relatively low fines content (Photo 10.3) to appreciable fines (Photo 10.4). Beneath this layer, the alluvium became much more narrowly (poorly) graded and fine-grained, typically consisting of silty sands or fine sands, with some thin clayey lenses or beds present. Where gravelly layers were present, they were typically thin and the gravel clasts were subrounded to well rounded. This finer-grained alluvial unit was typically reddish brown to yellowish brown indicating an oxidizing environment. The color variation often present over relatively short intervals is illustrated in Photo 10.5. The drilling program was expanded when this unit was encountered in an attempt to determine its thickness. However, several approximately 100-foot deep boreholes never encountered the base of this unit, so its actual thickness remains unknown. The CPT rig was utilized to provide additional information, re-utilizing shallow sonic boreholes that had penetrated through the coarse alluvium to allow undisturbed CPT probing of the finer-grained alluvium below.

### 10.2.2 Pond Interiors

Test pits were excavated in Ponds 13 and 18. These investigations typically encountered either calcines, settled solids, or both (Photo 10.6). The objective of the three (3) test pits excavated in Pond 18 was primarily to assess the nature of the coarse alluvium underlying the pond and to collect samples for gradation analysis to evaluate the potential for the alluvium to transmit seepage from the pond. These test pits encountered treatment solids overlying some thin deposits of calcines in the floor of the pond.

Test pits were excavated in Pond 13 to provide preliminary information on the contents of this pond, which had previously been unexplored and thus unknown. Where the pond was accessible, the "long-stick" excavator described previously was utilized to reach into the pond and excavate two test pits. The test pits encountered a thin layer of solids (visible on the surface) over a thicker layer of calcines.

### 10.2.3 Permanent Drying Facility (PDF)

Boreholes and CPT probes were completed in the interior of Ponds 16/17 where the existing interim and proposed Permanent Drying Facility are located. In addition, exploratory borings and test pits were located in the pre-existing Pond 16 and 17 dikes. The objective of these investigations was to evaluate the existing embankment fill, the thick calcines deposited in the interior of the ponds, and the alluvial/colluvial/possible waste rock foundation for suitability as the preferred location for the Permanent Drying Facility. Sonic-drilled boreholes provided SPT testing and Shelby tube samples as well as bulk core barrel sample collection of calcines, dike fill and alluvial/colluvial materials, as appropriate. Except for the interior calcines, and increased waste rock materials encountered in dike fill (Photo 10.7), and foundation areas, conditions encountered were similar to those encountered in the flood dike / lower ponds exploration.

### 10.2.4 Alternative North Drying Facility/Repository (ADF/R)

Two sonic borings (ADF/R Series), two test pits (TP2011-15 and -16) and two CPT probes (in the ADF/R borings) were completed in the ADF/R area to characterize conditions influencing subgrade foundation settlement and stability of the ADF/R. The area is known to have contained a lined pond used as a heap leach facility. Following termination of the leach heap operations, the pond is known to have received a small amount of lime treatment solids, believed to have been transferred from Pond 18 in approximately the mid 1990s. The exploratory borings and test pits confirmed the presence of both a lined pond and the presence of a thin layer of settled solids (Photo 10.8).

The liner is approximately four feet below current surface grade and the former pond has generally been filled in with a grey silty, cobbly, sandy gravel, which may be from the former pond dikes. Gravel and cobble clasts are typically subangular. The solids previously described are less than six (6) inches thick and are within a few inches of the liner, indicating that at the time of their deposition, the pond was essentially empty.

Below the liner, conditions are varied, but it is interpreted that the area has been filled. In some areas (TP2011-15), clean fill was used and in other areas (TP2011-16, ADF/R-1 and ADF/R-2) the fill contains appreciable calcines and/or timber and cable debris. Fill appears to be derived from local colluvium (Photo 10.9) and/or coarse alluvium (Photo 10.10). Coarse alluvium is generally present below the fill (Photo 10.11). Borehole target depths did not penetrate through the coarse alluvium, so it is not known if the finer-grained alluvium observed to underlie the ponds system is present in this area. CPT probes were attempted in the completed ADF/R boreholes, but reached refusal quickly in the coarse alluvium.

### 10.2.5 North Stacked Repository (NSR)

The objective of investigating the alternative North Stacked Repository (NSR) area was to characterize the repository subgrade, including acquiring information to support evaluation of the stability of the fill/mine waste/demolition debris, landslide and alluvial materials known or inferred to underlie the site.

This area contains several features, including a landslide described in more detail in Sections 3.0 and 10.1.2. The area is believed to contain the buried remains of a former acid production plant that was demolished and at least partially buried in-place. Undated photos (Photos 10.12 and 10.13) illustrate demolition and indicate partial burial of the structures associated with the plant.

Four sonic boreholes (NSR series), three test pits (TP2011-12 through -14) and one CPT probe were conducted in the area. Exploration confirmed the presence of buried debris in the area, including steel "I" beams, cables, concrete and other debris (Photo 10.14). In general, the shallow soils appear to consist of fill and/or colluvium and/or landslide deposits, which typically consist of dark brown or red brown sandy gravelly clays / clayey gravels with cobbles and boulders (Photo 10.15). Clasts of gravel, cobbles and boulders are typically subangular to angular, but include some subrounded clasts as well. At varied depths, typically in excess of 20 feet depending on location, the exploratory holes encountered variably graded alluvium. Possible slip planes were noted in the logs, but no sheared material or other evidence of significant movement was identified. At further depth (90 feet in Borehole NSR-4), apparent bedrock or a very large bedrock fragment or boulder was encountered.

### 10.2.6 South Stacked Repository (SSR)

The objective of investigating the alternative South Stacked Repository (SSR) area was to characterize the repository subgrade, including acquiring information to support evaluation of potential foundation settlement and instability, particularly of the calcines in the Ponds 16/17 area.

This area contains several surficial features, including concrete foundations, calcines in the Ponds 16/17 area, and a wedge of fill and/or colluvium against the steep hillside to the east (Photo 10.16). The area is believed to potentially contain buried debris associated with buildings that appear on the hillside in historic photos of the area. Historic photos also indicate that portions of this area (generally the central, middle-elevation area) were utilized as a waste rock dump for the St. Louis Tunnel (adit) excavation (McCoy, Collman and Graves, 1996).

Five sonic boreholes (SSR series), three test pits (TP2011-17 through -19) and one CPT probe were conducted in the area. Exploration confirmed the presence of minor buried debris, including some bricks and PVC pipe (TP2011-18 and -19). In general, the shallow soils on the upper eastern hillside appear to consist of fill and/or colluvium, which typically consist of dark brown clayey sandy gravels / clayey gravels with cobbles and boulders (Photo 10.17). Clasts of gravel, cobbles and boulders are typically subangular to angular, but include some subrounded clasts as well. In general, the surficial soils of the middle portion are believed to be fill or waste rock, and the western portion of the site (now covered by the interim drying facility) consisted of a relatively thin layer of fill over calcines (see discussion of permanent drying facility exploration discussed in Section 10.2.3). At depth, coarser- and finer-grained alluvium was encountered (see discussion in Section 10.2.1). These boreholes did not encounter bedrock.

## 10.3 Preliminary Interpretation of ReMi Tests

The results of ReMi tests performed as described in Section 7.0 are presented in Appendix A4. By way of interpretation, materials with higher shear wave velocities (very dense soil or bedrock) are indicated by red and yellow shades. Very stiff or dense soils are represented by green and light blue shades. Materials with lower shear wave velocities (medium dense and firm soils) are indicated by dark blue shades. Very loose or soft soils with shear wave velocities in the range of 500 to 600 feet per second are indicated by purple and pink shades.

In terms of potential strength loss during a design earthquake event affecting the Site, it has been found that materials having a shear wave velocity greater than about 650 feet per second are resistant to liquefaction, regardless of the magnitude of the earthquake. An evaluation of the anticipated behavior of the finer-grained granular soils at the site as part of forthcoming analyses and design under Task F will include further evaluation of the ReMi results reported here.

The ReMi tests revealed conditions that were generally consistent with the soil test boring data. However, shear wave velocities interpreted by the ReMi tests were somewhat more uniform than what might be expected from the standard penetration test values (N-values) in strata having a significant percentage of gravel. This is likely due to the amplification of N-values resulting from the presence of the coarse-grained materials (i.e., gravel and cobbles). A summary of the results of each seismic line is presented below.

*Line RM-1*

The shear wave velocity profile interpreted along Line RM-1 was found to be relatively uniform with shear wave velocities typically ranging from about 800 to 1300 feet per second within the upper 25 to 35 feet. Below this, values generally increased to a range of 1500 to 2000 feet per second. No potentially liquefiable materials were detected. No hard rock was interpreted to a depth of 100 feet along this array.

*Line RM-2*

The subsurface profile in this location was found to be somewhat variable, with relatively soft or loose deposits extending to depths of over 70 feet in some areas. Typically, the lower shear wave velocity materials, falling in a range of 1000 to 1300 feet per second, were found within the upper 25 to 30 feet of the ground surface with higher variability with depth. The highest shear wave velocities detected (in the range of 1500-200o feet per second) were within the northern portion of the array at a depth beginning about 70 feet below grade. The shear wave velocity of this material is lower than might be expected for intact bedrock. No potentially liquefiable materials were detected.

*Line RM-3*

Along this seismic line, significant variations were noted from the south to the north. Within the southern portion of the array, a zone of soft or loose material was detected at a depth of about 10 feet, beneath a somewhat denser crust. In this loose zone, shear wave velocities were interpreted to be as low as about 600 feet per second. The potential for these soils to experience liquefaction is being further evaluated. However, initial analysis based on the preliminary design earthquake event (to be refined and reported later as part of ongoing geotechnical analyses) suggests that even these relatively loose soils may perform adequately under the design ground motions likely to be adopted for design. Below this loose zone, medium dense to dense soils were encountered to a depth of 100 feet. The loose zone was found to thin toward the northern end of the array. At the northern end, a very hard or dense material was interpreted from near the ground surface. This may represent a man made structure and will be further investigated by other means.

*Line RM-4*

Conditions along Line RM-4 generally were found to include loose to very loose strata within about 30 feet of the ground surface. The lowest shear wave velocities were found to range as low as about 500 feet per second which suggests that some of these soils have some potential for liquefaction depending on the characteristics of the design earthquake event for the site still under development. With greater depth, soil strata were interpreted to be medium dense to very dense. Possible bedrock was detected beginning at depths of about 70 to 80 feet within the central to northern portion of the array.

*Line RM-5*

This seismic line detected relatively uniform results along the extent of the array. Beneath a near surface zone of material having a shear wave velocity in the range of 700 to 800 feet per second, a 10- to 15-foot thick stratum of loose soils was interpreted by the ReMi test. The shear wave velocity in this loose zone was found to range from about 500 to 600 feet per second. This suggests that some of these soils have some potential for liquefaction (again depending on the characteristics of the design earthquake still under development). Beneath the loose stratum, the shear wave velocities were found to gradually increase to about 1500 feet per second. No apparent bedrock was noted within 100 feet of the ground surface.

*Line RM-6*

Considerable variations in subsurface shear wave velocities were noted along Line RM-6. Most of the materials to a depth of 100 feet exhibited shear wave velocities of 1300 feet per second or greater. However, within the southern section of the line, a zone of lower shear wave velocity materials was detected beneath and above denser soils. The lowest shear wave velocity recorded in this anomalous stratum was approximately 600 feet per second. However, this zone is present nearly 80 feet below grade. In general, liquefaction is not thought to occur below a depth of about 75 feet. Shear wave velocities in this area are interpreted as indicating the presence of bedrock at depths ranging from about 80 to 90 feet below grade.

# 11.0 References

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# TABLES

**Table 1.1A** - Summary of 2011 Laboratory Test Results (Sheet 1 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| ADF/R-1 | 0-5 | BULK | - | - | 47 | 24 | 19 | - | - | 129.6 | 9.5 | - | - | GM |
| ADF/R-1 | 10 | SS | 16.3 | - | - | - | - | - | - | - | - | - | - | SW |
| ADF/R-1 | 13 | SS | 49.4 | - | - | - | - | - | - | - | - | - | - | SW |
| ADF/R-1 | 17 | SS | 46.4 | - | - | - | - | NP | NP | - | - | - | - | SM |
| ADF/R-1 | 22 | SS | 11.7 | - | - | - | - | - | - | - | - | - | - | SM |
| ADF/R-2 | 2 | SS | 13.8 | - | - | - | - | - | - | - | - | - | - | SM |
| ADF/R-2 | 6 | SS | 10.9 | - | - | - | - | - | - | - | - | - | - | SM |
| ADF/R-2 | 12 | SS | 9 | - | 73 | 20 | 7 | - | - | - | - | - | - | GM |
| ED-1 | 1 | SS | 7.8 | - | 44 | 33 | 23 | - | - | - | - | - | - | GC |
| ED-1 | 2.5 | SS | - | - | - | - | - | - | - | - | - | - | - | GC |
| ED-1 | 4 | SS | 10.4 | - | - | - | - | - | - | - | - | - | - | GC |
| ED-1 | 5 | SS | - | - | - | - | - | - | - | - | - | - | - | OL |
| ED-1 | 7.5 | SS | - | - | - | - | - | - | - | - | - | - | - | GW-GM |
| ED-1 | 12 | SS | 13.6 | - | - | - | - | NP | NP | - | - | - | - | SC |
| ED-1 | 20 | SS | 11.3 | - | - | - | - | NP | NP | - | - | - | - | SM |
| ED-1 | 26 | SS | 22.8 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 31 | SS | 22 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 36 | SS | 25.3 | - | - | - | - | NP | NP | - | - | - | - | SM |
| ED-1 | 46 | SS | 22.1 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 56 | SS | 23.8 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 61 | SS | 24 | - | - | - | - | NP | NP | - | - | - | - | SM |
| ED-1 | 66 | SS | - | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 71 | SS | 25.3 | - | - | - | - | NP | NP | - | - | - | - | SM |
| ED-1 | 76 | SS | 26.9 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 86 | SS | - | - | - | - | - | - | - | - | - | - | - | SM |
| ED-1 | 91 | SS | - | - | - | - | - | NP | NP | - | - | - | - | CL |
| ED-1 | 96 | SS | - | - | - | - | - | - | - | - | - | - | - | CL |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 2 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| ED-2 | 1 | SS | 4.6 | - | - | - | - | 23 | NP | - | - | - | - | GW |
| ED-2 | 0-4 | BULK | - | - | 54 | 25 | 21 | - | - | 138.5 | 7 | - | - | GW |
| ED-2 | 4-5 | BULK | - | - | - | - | - | - | - | - | - | - | - | GW & SM-GM |
| ED-2 | 6 | SS | 12.9 | - | 58 | 27 | 15 | 23 | NP | - | - | - | - | GM-GP |
| ED-2 | 11 | SS | 17 | - | - | - | - | - | - | - | - | - | - | GM-GP |
| ED-2 | 7.5-12 | BULK | - | - | - | - | - | - | - | - | - | - | - | GM-GP |
| ED-2 | 16 | SS | 15.6 | - | - | - | - | - | - | - | - | - | - | GM-GP |
| ED-2 | 21 | SS | 19.1 | - | 12 | 36 | 52 | NP | NP | - | - | - | - | SM |
| ED-2 | 26 | SS | - | - | - | - | - | - | - | - | - | - | - | SM |
| ED-3 | 1 | SS | - | - | - | - | - | - | - | - | - | - | - | GM |
| ED-3 | 4 | SS | 32.9 | - | - | - | - | 26 | NP | - | - | - | - | OL |
| ED-3 | 4-7.5 | BULK | - | - | 5 | 53 | 42 | - | - | 105.2 | 17.7 | - | - | OL & SM |
| ED-3 | 8 | SS | 47.4 | - | - | - | - | 29 | NP | - | - | - | - | ML-OL |
| ED-3 | 12 | SS | 15.2 | - | 41 | 48 | 11 | NP | NP | - | - | - | - | GM-GC |
| ED-3 | 10-17.5 | BULK | - | - | - | - | - | - | - | - | - | - | - | SW & GM-GC |
| ED-3 | 23 | SS | - | - | - | - | - | - | - | - | - | - | - | SM |
| ED-3 | 22.5-30 | BULK | - | - | - | - | - | - | - | - | - | - | - | SM |
| ED-4 | 1 | SS | 6.4 | - | - | - | - | 24 | 6 | - | - | - | - | GC-GM |
| ED-4 | 0-5 | BULK | - | - | 35 | 37 | 28 | - | - | 131.4 | 9.7 | - | - | GC-GM |
| ED-4 | 6 | SS | 9.7 | - | - | - | - | - | - | - | - | - | - | GC-GM |
| ED-4 | 11 | SS | 11 | - | - | - | - | - | - | - | - | - | - | GW |
| ED-4 | 16 | SS | 11 | - | - | - | - | 24 | 7 | - | - | - | - | GC |
| ED-4 | 21 | SS | 12.9 | - | - | - | - | - | - | - | - | - | - | GC |
| ED-4 | 26 | SS | 23.5 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-5 | 1 | SS | - | - | - | - | - | - | - | - | - | - | - | GC-GM |
| ED-5 | 0-5 | BULK | 11.3 | - | 49 | 30 | 21 | 27 | 8 | 137.8 | 8.3 | - | - | GC-GM |
| ED-5 | 9 | SS | - | - | - | - | - | - | - | - | - | - | - | GC-GM |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 3 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-311 | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| ED-5 | 7.5-12 | BULK | 13 | - | 67 | 21 | 12 | 28 | 9 | - | - | - | - | GC-GM |
| ED-5 | 13 | SS | - | - | - | - | - | - | - | - | - | - | - | SM-GM |
| ED-5 | 16 | SS | - | - | - | - | - | - | - | - | - | - | - | GW |
| ED-5 | 14-20 | BULK | 120.6 | - | 61 | 31 | 8 | 20 | NP | - | - | - | - | GW |
| ED-5 | 21 | SS | - | - | - | - | - | - | - | - | - | - | - | GW-GC |
| ED-5 | 26 | SS | - | - | - | - | - | - | - | - | - | - | - | GW-GC |
| ED-6 | 1 | SS | 9 | - | - | - | - | 26 | 6 | - | - | - | - | GW-GM |
| ED-6 | 0-5 | BULK | - | - | 37 | 36 | 27 | - | - | 123.9 | 10.5 | - | - | GW-GM |
| ED-6 | 6 | SS | 12.9 | - | - | - | - | 23 | 1 | - | - | - | - | GC |
| ED-6 | 11 | SS | 20.8 | - | - | - | - | - | - | - | - | - | - | GC |
| ED-6 | 16 | SS | 28.1 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-6 | 15-20 | BULK | - | - | 0 | 59 | 41 | - | - | - | - | - | - | SM |
| ED-6 | 21 | SS | 28.1 | - | - | - | - | - | - | - | - | - | - | SM |
| ED-6 | 26 | SS | 31.6 | - | - | - | - | - | - | - | - | - | - | SM |
| MW-1D | 1 | SS | 9.8 | - | - | - | - | 23 | 3 | - | - | - | - | GC |
| MW-1D | 0-5 | BULK | - | - | 48 | 34 | 18 | - | - | 134 | 7.2 | - | - | GC |
| MW-1D | 6 | SS | 17.4 | - | - | - | - | - | - | - | - | - | - | GC |
| MW-1D | 13 | SS | 19.5 | - | - | - | - | 22 | 5 | - | - | - | - | GM-GC |
| MW-1D | 12.5-18.5 | BULK | - | - | 54 | 33 | 13 | - | - | - | - | - | - | GM-GC |
| MW-1D | 21 | SS | 9.7 | - | - | - | - | - | - | - | - | - | - | GM-GC |
| MW-1D | 26 | SS | 7.8 | - | - | - | - | - | - | - | - | - | - | GM-GC |
| MW-2D | 1 | SS | 7.9 | - | - | - | - | 25 | 2 | - | - | - | - | GM |
| MW-2D | 0-5 | BULK | - | - | 48 | 34 | 18 | - | - | 123.7 | 13.2 | - | - | GM |
| MW-2D | 6 | SS | 9.6 | - | - | - | - | - | - | - | - | - | - | GM |
| MW-2D | 5-10 | BULK | - | - | - | - | - | - | - | - | - | - | - | GM |
| MW-2D | 13 | SS | 11 | - | - | - | - | - | - | - | - | - | - | GM |
| MW-2D | 11.5-15 | BULK | - | - | 67 | 26 | 7 | - | - | - | - | - | - | GW & GM |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 4 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-311 | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| MW-2D | 18 | SS | 9.2 | - | - | - | - | - | - | - | - | - | - | GM |
| MW-2D | 22 | SS | 16.6 | - | - | - | - | NP | NP | - | - | - | - | SW |
| MW-3D | 1 | SS | 9.5 | - | - | - | - | 26 | 11 | - | - | - | - | GM-GC |
| MW-3D | 0-5 | BULK | - | - | 58 | 24 | 18 | - | - | 122.9 | 10.8 | - | - | GM-GC & GW & GC |
| MW-3D | 6 | SS | 10.6 | - | - | - | - | - | - | - | - | - | - | GC |
| MW-3D | 5-8 | BULK | - | - | - | - | - | - | - | - | - | - | - | GC & GW |
| MW-3D | 11 | SS | 15.5 | - | - | - | - | - | - | - | - | - | - | GW |
| MW-3D | 10-15 | BULK | - | - | 56 | 33 | 11 | - | - | - | - | - | - | GW & SW |
| MW-3D | 16 | SS | 12.8 | - | - | - | - | - | - | - | - | - | - | GW |
| MW-3D | 21 | SS | 16.4 | - | - | - | - | - | - | - | - | - | - | GW-GC |
| MW-4D | 1 | SS | - | - | - | - | - | - | - | - | - | - | - | GC |
| MW-4D | 0-5 | BULK | - | - | - | - | - | - | - | - | - | - | - | GC & GW-GC |
| MW-4D | 6 | SS | - | - | - | - | - | - | - | - | - | - | - | GW-GC |
| MW-4D | 11 | SS | - | - | - | - | - | - | - | - | - | - | - | GW-GC |
| MW-4D | 16 | SS | - | - | - | - | - | - | - | - | - | - | - | GC |
| MW-4D | 21 | SS | - | - | - | - | - | - | - | - | - | - | - | GM-GC |
| MW-4D | 20-25 | BULK | - | - | - | - | - | - | - | - | - | - | - | GM-GC & GW |
| MW-4D | 28 | SS | - | - | - | - | - | - | - | - | - | - | - | GW |
| MW-5D | 7 | SS | 28.2 | - | - | - | - | - | - | - | - | - | - | SP |
| MW-5D | 6-15 | BULK | - | - | 0 | 64 | 36 | - | - | 104.8 | 28.5 | - | 4.48 | SC & SP |
| MW-5D | 17 | SS | 60 | - | - | - | - | NP | NP | - | - | - | - | SP-SM |
| MW-5D | 15-20 | BULK | - | - | 0 | 30 | 70 | - | - | 95.7 | 35.1 | - | 4.59 | SP & SP-SM |
| MW-5D | 22 | SS | - | - | - | - | - | - | - | - | - | - | - | ML-OL |
| MW-5D | 26 | SS | 18.7 | - | - | - | - | - | - | - | - | - | - | GW-GM |
| MW-5D | 25-30 | BULK | - | - | 70 | 20 | 10 | - | - | - | - | - | - | GW-GM & GW |
| MW-5D | 31 | SS | 41 | - | - | - | - | - | - | - | - | - | - | GW-GM |
| MW-5D | 30-35 | BULK | - | - | 72 | 21 | 7 | - | - | - | - | - | - | GW-GM |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 5 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-311 | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| MW-6D | 1 | SS | 7.8 | - | - | - | - | - | - | - | - | - | - | GW-GM |
| MW-6D | 0-3.5 | BULK | - | - | 55 | 28 | 17 | - | - | 136.1 | 8.2 | - | - | GW-GM |
| MW-6D | 5 | SS | 9.8 | - | - | - | - | 26 | 6 | - | - | - | - | GC |
| MW-6D | 3.5-7.5 | BULK | - | - | 47 | 34 | 19 | - | - | 127 | 12.1 | - | - | GC |
| MW-6D | 10 | SS | 9.1 | - | - | - | - | - | - | - | - | - | - | GC |
| MW-6D | 14 | SS | 6 | - | - | - | - | - | - | - | - | - | - | GW-GM |
| MW-6D | 18 | SS | 26.4 | - | - | - | - | 42 | 14 | - | - | - | - | ML-OL |
| MW-6D | 17.5-20 | BULK | - | - | 19 | 29 | 52 | - | - | - | - | - | - | ML-OL |
| MW-6D | 25 | SS | 18.4 | - | - | - | - | 22 | 4 | - | - | - | - | SC |
| MW-6D | 33 | SS | 24.1 | - | - | - | - | - | - | - | - | - | - | GW |
| MW-6D | 31.5-36.5 | BULK | - | - | 48 | 30 | 22 | - | - | - | - | - | - | GW |
| NSR-1 | 7 | SS | 15.4 | - | 22 | 44 | 34 | - | - | - | - | - | - | ML |
| NSR-1 | 13 | SS | 14.7 | - | - | - | - | 26 | 8 | - | - | - | - | CL |
| NSR-1 | 17 | SS | 14.7 | - | - | - | - | - | - | - | - | - | - | CL |
| NSR-1 | 26 | SS | 15.2 | - | - | - | - | - | - | - | - | - | - | GM |
| NSR-1 | 31 | SS | 12.5 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-1 | 34 | SS | - | - | 57 | 29 | 14 | - | - | - | - | - | - | GM |
| NSR-1 | 43 | SS | 10 | - | - | - | - | 22 | 3 | - | - | - | - | GC |
| NSR-2 | 0-5 | BULK | - | - | 39 | 41 | 20 | - | - | 132.5 | 7.3 | - | - | GM |
| NSR-2 | 7-10 | BULK | - | - | - | - | - | 28 | NP | - | - | - | - | |
| NSR-2 | 10-12.5 | BULK | 23.7 | - | - | - | - | - | - | - | - | - | - | GM |
| NSR-2 | 15-20 | BULK | - | - | 64 | 25 | 11 | - | - | - | - | - | - | GC |
| NSR-2 | 30-35 | BULK | 15.8 | - | - | - | - | 23 | 7 | - | - | - | - | GM |
| NSR-2 | 35-40 | BULK | 17 | - | - | - | - | - | - | - | - | - | - | SP |
| NSR-2 | 55-56 | BULK | 28.6 | - | - | - | - | - | - | - | - | - | - | SP |
| NSR-2 | 60-62 | BULK | 27.4 | - | - | - | - | - | - | - | - | - | - | GM |
| NSR-2 | 67-70 | BULK | 26.3 | - | - | - | - | - | - | - | - | - | - | SP |
| NSR-2 | 70-72 | BULK | 13 | - | - | - | - | - | - | - | - | - | - | SP |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 6 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| NSR-3 | 78-80 | BULK | 21.8 | - | - | - | - | - | - | - | - | - | - | SP |
| NSR-3 | 0-5 | BULK | - | - | 53 | 27 | 20 | - | - | 133.1 | 8.6 | - | - | GM |
| NSR-3 | 5-10 | BULK | 14.8 | - | - | - | - | 32 | 12 | - | - | - | - | GC |
| NSR-3 | 13-15 | BULK | 12.8 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-3 | 15-18 | BULK | 9.3 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-3 | 23-25 | BULK | 14.4 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-3 | 34-37 | BULK | 18.9 | - | - | - | - | - | - | - | - | - | - | SP |
| NSR-3 | 40-45 | BULK | 17.5 | - | - | - | - | - | - | - | - | - | - | GM |
| NSR-3 | 47-50 | BULK | 12.1 | - | - | - | - | - | - | - | - | - | - | GM |
| NSR-4 | 0-5 | BULK | - | - | 35 | 39 | 26 | - | - | - | - | - | - | GM |
| NSR-4 | 12 | SS | 15.5 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-4 | 17 | SS | - | - | 51 | 30 | 19 | - | - | - | - | - | - | |
| NSR-4 | 27 | SS | 13.5 | - | - | - | - | - | - | - | - | - | - | CL |
| NSR-4 | 31 | SS | 22.1 | - | - | - | - | 21 | NP | - | - | - | - | CL |
| NSR-4 | 41 | SS | 11.1 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-4 | 47 | SS | 13.8 | - | - | - | - | - | - | - | - | - | - | GM |
| NSR-4 | 59 | SS | 10 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-4 | 70 | SS | 9.3 | - | - | - | - | - | - | - | - | - | - | GC |
| NSR-4 | 75 | SS | 8.3 | - | - | - | - | - | - | - | - | - | - | SW |
| PDF-1 | 1 | SS | 8.5 | - | 57 | 31 | 12 | - | - | - | - | - | - | GW |
| PDF-1 | 4 | SS | 15.5 | - | 0 | 72 | 28 | NP | NP | - | - | - | - | SM |
| PDF-1 | 11 | SS | 22.3 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-1 | 16 | SS | 216.7 | - | 0 | 57 | 43 | - | - | - | - | - | - | SM |
| PDF-1 | 21 | SS | 46.5 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-1 | 33 | SS | 10.9 | - | 65 | 26 | 9 | - | - | - | - | - | - | SW |
| PDF-1 | 38 | SS | 29.1 | - | - | - | - | - | - | - | - | - | - | SW |
| PDF-1 | 43 | SS | 15.5 | - | - | - | - | - | - | - | - | - | - | SW |
| PDF-1 | 48 | SS | 23.7 | - | 1 | 75 | 24 | - | - | - | - | - | - | SP-SW |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 7 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| PDF-2 | 2 | SS | 17.5 | - | - | - | - | NP | NP | - | - | - | - | SM |
| PDF-2 | 2-5 | BULK | - | - | 0 | 75 | 25 | - | - | - | - | - | - | SM |
| PDF-2 | 6 | SS | 20.4 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-2 | 11 | SS | 29.9 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-2 | 10-15 | BULK | - | - | 0 | 63 | 37 | - | - | - | - | - | - | SM |
| PDF-2 | 17 | SS | 55.9 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-2 | 21 | SS | 62.6 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-2 | 20-25 | BULK | - | - | 4 | 51 | 45 | - | - | - | - | - | - | SM |
| PDF-2 | 28 | SS | 41 | - | - | - | - | - | - | - | - | - | - | GW-GM |
| PDF-2 | 27-30 | BULK | - | - | 66 | 18 | 16 | - | - | - | - | - | - | GW-GM |
| PDF-3 | 0-3.5 | BULK | - | - | 34 | 51 | 15 | - | - | 131.7 | 7.8 | - | - | GW |
| PDF-3 | 4 | SS | 19 | - | - | - | - | 27 | NP | - | - | - | - | GC |
| PDF-3 | 9 | SS | 30.2 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-3 | 7.5-12 | BULK | - | - | 0 | 8 | 92 | - | - | - | - | - | - | SM |
| PDF-3 | 19 | SS | 39.5 | - | - | - | - | - | - | - | - | - | - | SM |
| PDF-3 | 24 | SS | 53.7 | - | - | - | - | 40 | NP | - | - | - | - | ML-OL |
| PDF-3 | 23-25 | BULK | - | - | 0 | 16 | 84 | - | - | - | - | - | - | ML-OL |
| SSR-1 | 1 | SS | 9.6 | - | - | - | - | 29 | 12 | 136.8 | 6.8 | - | - | CL |
| SSR-1 | 1-8 | BULK | - | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 7 | SS | 9.5 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 10 | SS | 4 | - | 60 | 27 | 13 | 24 | NP | - | - | - | - | CL |
| SSR-1 | 17 | SS | 8.2 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 24 | SS | 12.1 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 30 | SS | 10 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 35 | SS | 11 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 48 | SS | 5.8 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-1 | 57 | SS | 9.7 | - | - | - | - | - | - | - | - | - | - | SW |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 8 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| SSR-1 | 63 | SS | 11.3 | - | - | - | - | - | - | - | - | - | - | GM |
| SSR-1 | 76 | SS | 16 | - | - | - | - | - | - | - | - | - | - | SM |
| SSR-1 | 90 | SS | 10.7 | - | - | - | - | - | - | - | - | - | - | SW |
| SSR-2 | 2 | SS | 9.8 | - | - | - | - | 28 | 9 | - | - | - | - | ML-OL |
| SSR-2 | 0-6 | BULK | - | - | - | - | - | - | - | 118.8 | 10.4 | - | - | ML |
| SSR-2 | 7 | SS | 6.9 | - | - | - | - | 28 | 10 | - | - | - | - | CL |
| SSR-2 | 6-12 | BULK | - | - | - | - | - | - | - | 121.1 | 9.9 | - | - | CL |
| SSR-2 | 12 | SS | 7.9 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-2 | 17 | SS | 12.4 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-2 | 24 | SS | 16 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-2 | 31 | SS | 20.5 | - | - | - | - | 28 | 11 | - | - | - | - | CL-CH |
| SSR-2 | 36 | SS | 28.8 | - | - | - | - | - | - | - | - | - | - | GC |
| SSR-2 | 66 | SS | 10.4 | - | 56 | 30 | 14 | - | - | - | - | - | - | GM |
| SSR-2 | 75 | SS | 37.7 | - | 55 | 34 | 11 | - | - | - | - | - | - | GM |
| SSR-3 | 2 | SS | - | - | - | - | - | - | - | - | - | - | - | GW-GC |
| SSR-3 | 8 | SS | - | - | - | - | - | - | - | - | - | - | - | GC |
| SSR-3 | 13 | SS | 15.4 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-3 | 18 | SS | - | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-3 | 30 | SS | 15 | - | - | - | - | - | - | - | - | - | - | CL |
| SSR-3 | 37 | SS | 20.2 | - | - | - | - | - | - | - | - | - | - | GC |
| SSR-3 | 39 | SS | 11.1 | - | - | - | - | - | - | - | - | - | - | GW-GC |
| SSR-3 | 53 | SS | 11.6 | - | - | - | - | - | - | - | - | - | - | GW-GC |
| SSR-3 | 70 | SS | 8.1 | - | - | - | - | - | - | - | - | - | - | GW-GC |
| SSR-3 | 76 | SS | 7.5 | - | - | - | - | - | - | - | - | - | - | SP |
| SSR-3 | 87A | SS | 7.9 | - | - | - | - | - | - | - | - | - | - | SP |
| SSR-3 | 87B | SS | 8.5 | - | - | - | - | - | - | - | - | - | - | SP |
| SSR-3 | 91 | SS | 19.3 | - | - | - | - | - | - | - | - | - | - | SW |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 9 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| SSR-3 | 95 | SS | 18.5 | - | - | - | - | - | - | - | - | - | - | SP-SM |
| SSR-4 | 0-4 | BULK | 7.5 | - | 36 | 38 | 26 | 24 | 4 | 126.6 | 10.3 | - | - | GW |
| SSR-5 | 0-4 | BULK | 6.5 | - | 57 | 33 | 10 | - | - | 132.8 | 7.3 | - | - | GW |
| SSR-5 | 6 | SS | 12.4 | - | 21 | 48 | 31 | 25 | 2 | - | - | - | - | SC |
| SSR-5 | 5-8 | BULK | - | - | - | - | - | - | - | - | - | - | - | SC |
| SSR-5 | 9 | SS | 29.3 | - | 12 | 23 | 65 | - | - | - | - | - | - | SM |
| SSR-5 | 8-12 | BULK | - | - | - | - | - | - | - | - | - | - | - | SM |
| SSR-5 | 13 | SS | 25.6 | - | - | - | - | - | - | - | - | - | - | SM |
| SSR-5 | 17 | SS | 42.9 | - | 1 | 30 | 69 | - | - | - | - | - | - | SM |
| SSR-5 | 15-20 | BULK | - | - | - | - | - | - | - | - | - | - | - | SM |
| SSR-5 | 22 | SS | 74.7 | - | 2 | 42 | 56 | - | - | - | - | - | - | SM |
| SSR-5 | 27 | SS | 13.2 | - | - | - | - | 21 | 1 | - | - | - | - | GC |
| SSR-5 | 32 | SS | 10.3 | - | - | - | - | - | - | - | - | - | - | 0 |
| SSR-5 | 40 | SS | 23.8 | - | - | - | - | - | - | - | - | - | - | SW |
| SSR-5 | 40-45 | BULK | - | - | 4 | 85 | 11 | - | - | - | - | - | - | SW |
| SSR-5 | 48 | SS | - | - | - | - | - | - | - | - | - | - | - | SP |
| SSR-5 | 47-50 | BULK | 26.9 | - | 0 | 61 | 39 | - | - | - | - | - | - | SP |
| SSR-5 | 57 | SS | - | - | - | - | - | - | - | - | - | - | - | SM |
| SSR-5 | 55-60 | BULK | 27.9 | - | 0 | 51 | 49 | - | - | - | - | - | - | SM |
| TP2011-AT1 | - | BULK | 12.8 | 97.5 | 32 | 45 | 23 | 24 | 6 | 127.2 | 9.2 | - | - | SC-SM |
| TP2011-AT2 | - | BULK | 11.7 | 100.8 | 46 | 37 | 17 | 21 | NP | 138 | 7.6 | - | - | GM |
| TP2011-AT3 | - | BULK | - | - | 49 | 38 | 13 | - | NP | 135.6 | 8.2 | - | - | GM |
| TP2011-AT5 | - | BULK | 15.8 | 118 | 50 | 31 | 19 | 35 | 8 | 133.4 | 8.4 | - | - | GM |
| TP2011-AT6 | - | BULK | 14.8 | 109.3 | 40 | 38 | 22 | 32 | 11 | 130.1 | 9.3 | - | - | GC |
| TP2011-FD1 | - | BULK | - | - | 84 | 11 | 5 | - | - | - | - | - | 2.721 | - |
| TP2011-FD2 | - | BULK | - | - | 49 | 27 | 24 | 27 | NP | 132.3 | 12.1 | - | - | - |
| TP2011-FD3 | - | BULK | - | - | 62 | 22 | 16 | 27 | 8 | 131.6 | 10.3 | - | - | - |

[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1A cont.** - Summary of 2011 Laboratory Test Results (Sheet 10 of 10)

| Sample Location | | | ASTM D2216 | ASTM D6938 | CP-31[1] | | | ASTM D4318 | | ASTM D698 | | Hand Penet. | AASHTO T85 | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) | Type | Natural Moisture Content (%) | Dry Unit Weight (pcf) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Unconfined Compressive Strength (psf) | Specific Gravity | Soil Classification |
| TP2011-FD4 | - | BULK | - | - | 52 | 25 | 23 | - | - | - | - | - | 2.726 | - |
| TP2011-FD5 | - | BULK | - | - | 29 | 16 | 55 | - | - | 132.4 | 9.9 | - | - | - |
| TP2011-FD6 | - | BULK | - | - | 55 | 25 | 20 | - | - | - | - | - | - | - |
| TP2011-FD7 | - | BULK | - | - | 77 | 15 | 8 | 22 | NP | 153.2 | 4.1 | - | - | - |
| TP2011-FD8 | - | BULK | - | - | 98 | 1 | 1 | - | - | - | - | - | - | - |
| TP2011-FD13 | - | BULK | - | - | 70 | 18 | 12 | - | - | - | - | - | 2.541 | - |
| TP2011-FD15 | - | BULK | - | - | 85 | 10 | 5 | - | - | - | - | - | 2.589 | - |

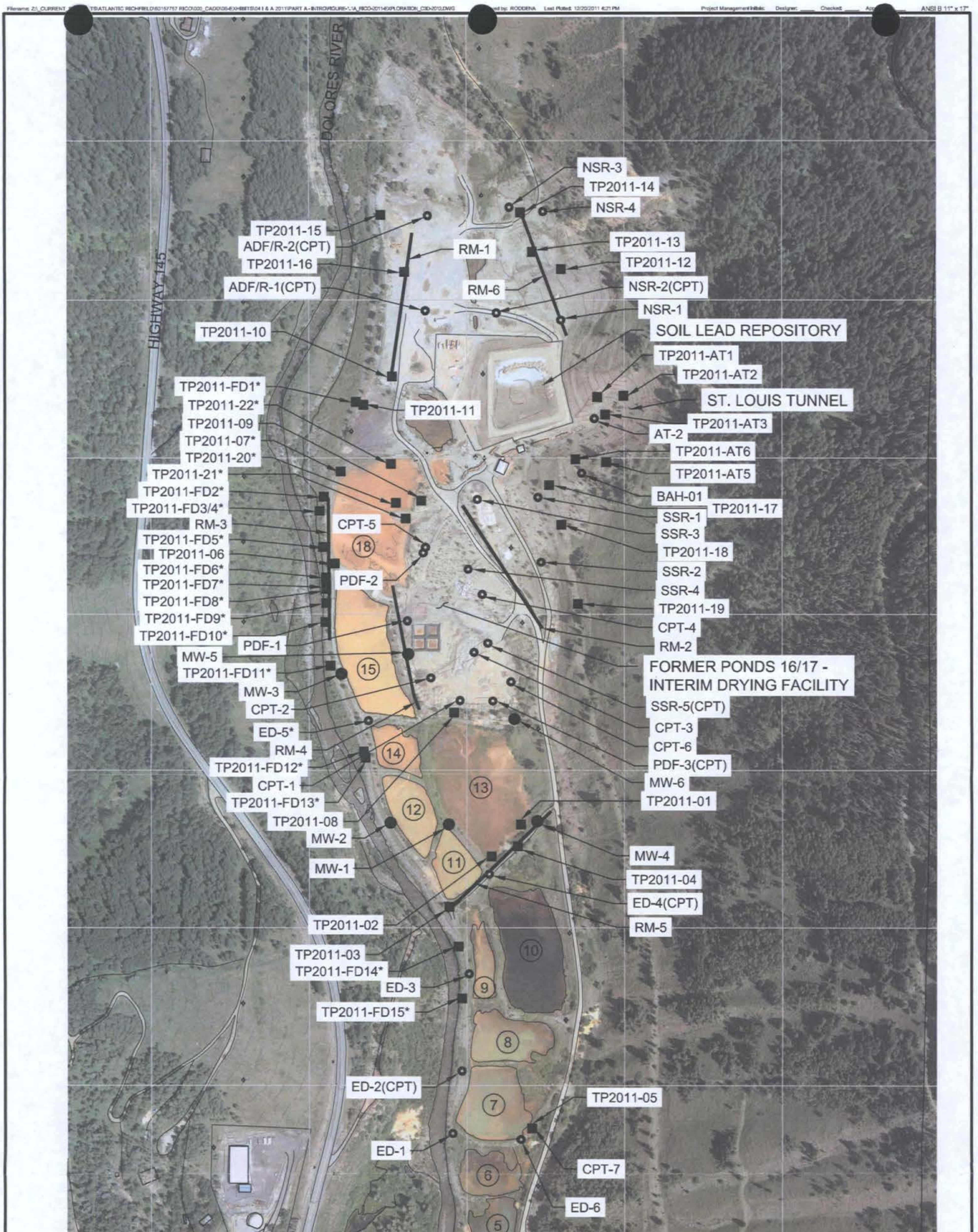
[1] CP-31 is a sieve analysis method established by the Colorado Department of Transportation that modifies AASHTO T11 and T27.

**Table 1.1B** - Summary of Prior Laboratory Test Results

| Sample Location | | | ASTM D2216 | Gradation | | | ASTM D4318 | | ASTM D1557 C | | USDA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Boring/ Test Pit | Depth (ft) / Location | Type | Natural Moisture Content (%) | Gravel > #4 (%) | Sand (%) | Fines < #200 (%) | LL | PI | MDD (pcf) | OMC (%) | Soil Classification |
| B-2 | 9.5 | - | - | 37 | 41 | 22 | - | - | - | - | - |
| B-4 | 9.5 | - | - | 41 | 37 | 22 | - | - | - | - | - |
| B-8 | 9.5 | - | - | 57 | 33 | 10 | - | - | - | - | - |
| B-9 | 19.5 | - | - | 0 | 35 | 65 | - | - | - | - | - |
| B-11 | 20 | - | - | 0 | 39 | 61 | - | - | - | - | - |
| St. Louis Adit | Cut Above Adit | Bulk | - | 49 | 43 | 8 | - | - | 133 | 7.5 | - |
| Dolores River | River Bank | Bulk | - | 54 | 16 | 30 | - | - | 131 | 11 | - |
| Dolores River | River Bed | Bulk | - | 90 | 5 | 5 | - | - | - | - | - |
| Near B-13 | 0 - 1 | Bulk | - | 71 | 26 | 3 | - | - | - | - | - |
| TP2004A-1 | - | Bulk | 14.9 | 59 | 28 | 13 | 26 | 8 | - | - | silty loam |
| TP2004A-2 | - | Bulk | 12.4 | 62 | 28 | 10 | 28 | 8 | - | - | silty loam |
| TP2004B | - | Bulk | 13.8 | 64 | 24 | 12 | 31 | 11 | - | - | silty loam |
| TP2004C | - | Bulk | 11.8 | 46 | 32 | 22 | 26 | 8 | - | - | silty loam |
| TP2004D | - | Bulk | 9.2 | 32 | 44 | 24 | 21 | 4 | - | - | silty loam |
| Line Camp Pit | - | Bulk | 14.9 | 10 | 54 | 36 | 21 | 3 | - | - | silty loam |
| Hay Camp Pit | - | Bulk | 4.1 | 1 | 14 | 85 | 28 | 8 | - | - | loam |
| Mountain Stone Pit | Topsoil | Bulk | 12.1 | 1 | 34 | 65 | 29 | 10 | - | - | loam |
| Mountain Stone Pit | 3/4" | Bulk | 4.7 | 62 | 28 | 10 | NP | NP | - | - | loamy sand |

# FIGURES

Filename: Z:_CURRENT_ TS\ATLANTIC RICHFIELD\60157757 RICO\000_CADD\05-EXHIBITS\04 I & A 2011\PART A - INTRO\FIGURE-1.1A_RICO-2011-EXPLORATION_C3D-2012.DWG ed by: RODDENA Last Plotted: 12/20/2011 4:21 PM Project Management Initials: Designer: ___ Checked: ___ Ap ANSI B 11" x 17"



# RICO-ARGENTINE SITE-OU01

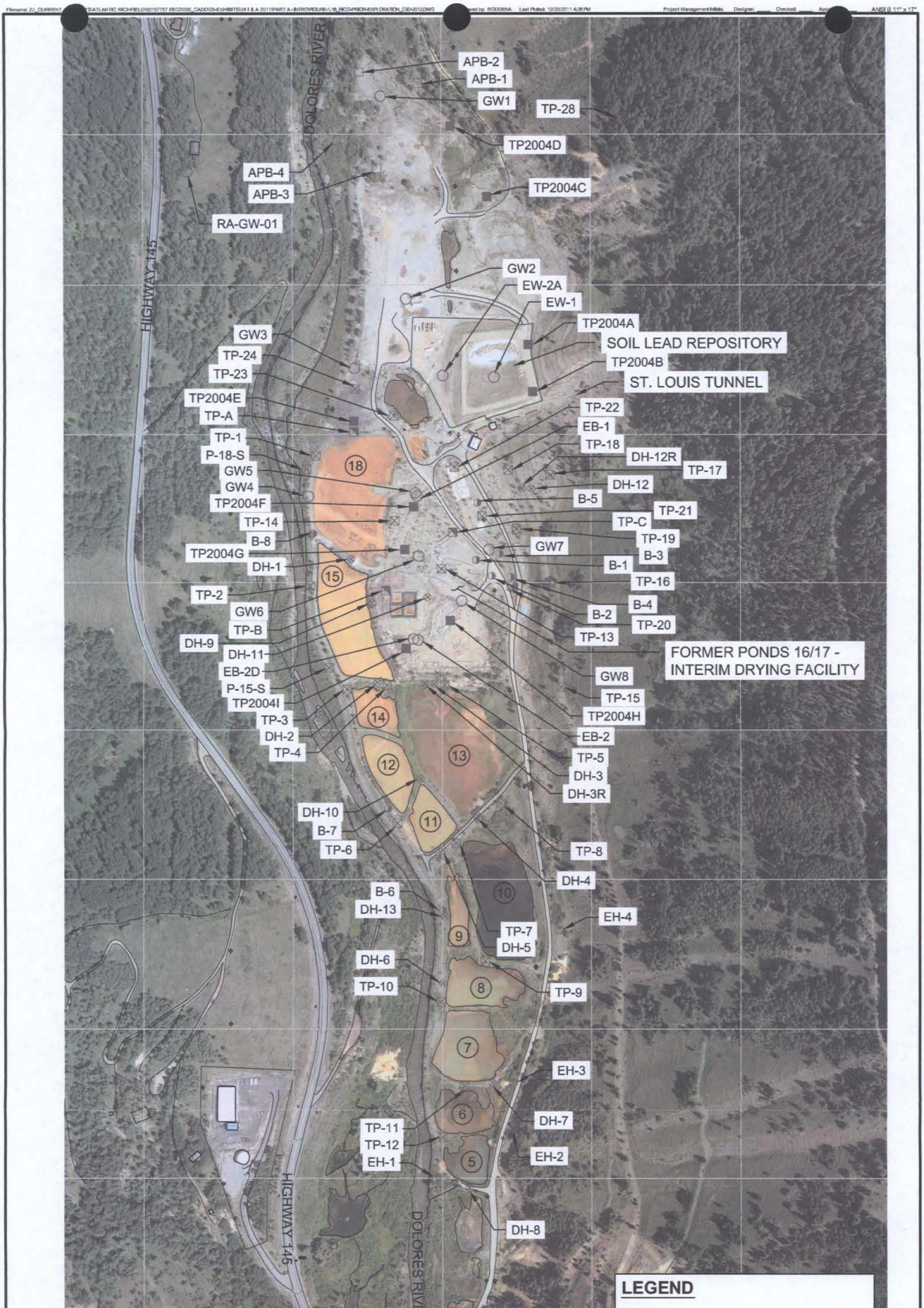
SUMMARY OF 2011 FIELD INVESTIGATIONS

FIGURE 1.1A

AECOM

60157757

Filename: Z:_CURRENT \ATLANTIC RICHFIELD\60157757 RICO\000_CADD\08-EXHIBITS\04 I & A 2011\PART A - INTRO\FIGURE-1.1B_RICO-PRIOR-EXPLORATION_C3D-2012.DWG ved by: RODDENA Last Plotted: 12/20/2011 4:28 PM Project Management Initials: Designer: ___ Checked: ___ App ANSI B 11" x 17"



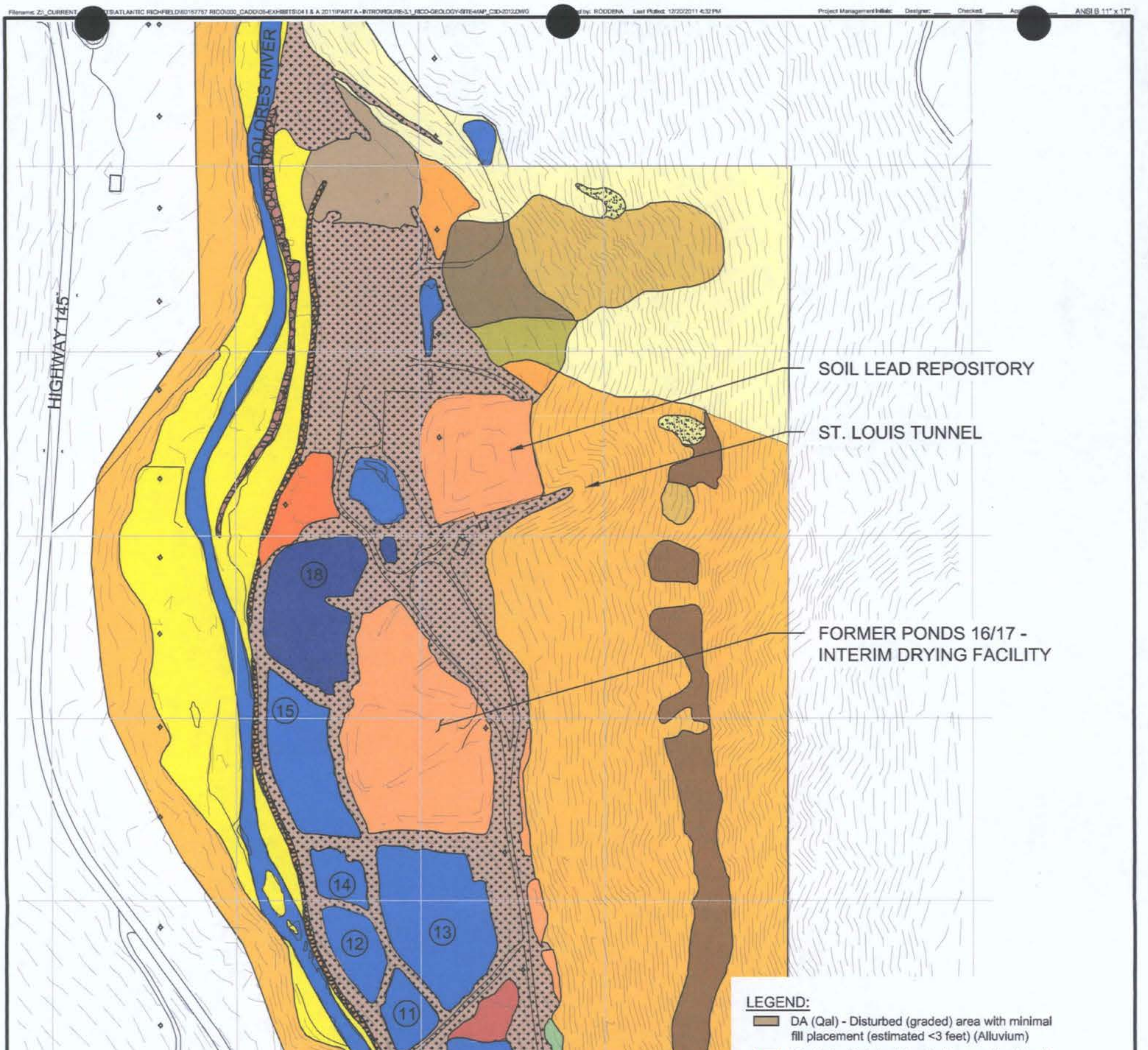
# RICO-ARGENTINE SITE-OU01

SUMMARY OF PRIOR FIELD INVESTIGATIONS

FIGURE 1.1B

AECOM

60157757



LEGEND:

- ■ DA (Qal) - Disturbed (graded) area with minimal fill placement (estimated <3 feet) (Alluvium)
- ■ DA (Qc) - Disturbed (graded) area with minimal fill placement (estimated <3 feet) (Colluvium)
- ■ DA (Qls/Qc) - Disturbed (graded) area with minimal fill placement (estimated <3 feet) (Landslide Deposit)
- ■ DA (Qlso) - Disturbed (graded) area with minimal fill placement (estimated <3 feet) (Older Landslide Deposit)
- ■ Dry Cell
- ▨ F - Fill (undifferentiated)
- ■ MW - Fill composed predominately of undifferentiated mine waste material
- ■ MW/T - Fill composed predominately of undifferentiated mine waste material/Tailings
- ▨ RR1 - Rip rap composed of angular rock boulders
- ▨ RR2 - Rip rap composed of rounded boulders derived from stream channel (i.e. dike)
- ■ T - Tailings
- ▨ WR - Waste Rock
- ■ Qal - Alluvium
- ■ Qc - Colluvium locally includes talus and small debris slides
- ■ Qlsa - Active Landslide deposit - evidence of recent activity (within the last several years)
- ■ Qls - Landslide deposit - evidence of historic activity (within the last several decades)
- ■ Qlso - Older Landslide deposit - surficial features suggest material probably has not moved in the past several decades or more
- ■ tr - travertine deposit associated with active hot spring
- ■ Phl - Hermosa Formation, lower member: consist of sandstone, siltstone, shale and arkose with local limestone and conglomerate beds. Locally includes discontinuous intrusions (i.e. sills and dikes) of hornblende latite porphyry.
- ■ g - Greenstone: Dark greenish -gray fine drained rock with mica, chlorite and epidote.
- ■ W - Water

# RICO-ARGENTINE SITE-OU01

OVERALL SITE GEOLOGY MAP

FIGURE 3.1

AECOM

60157757

Filename: Z:_CURRENT CTS\ATLANTIC RICHFIELD\60157757 RICO\000_CADD\06-EXHIBITS\04 I & A 2011\PART A - INTRO\FIGURE-10.1A_RICO-CHC-HILL-LANDSLIDE-2011_C3D-2012.DW Last saved by: RODDENA Last Plotted: 12/29/2011 4:09 PM Project Management Initials: Designer: ____ Checked: ____ App ____ ANSI B 11" x 17"

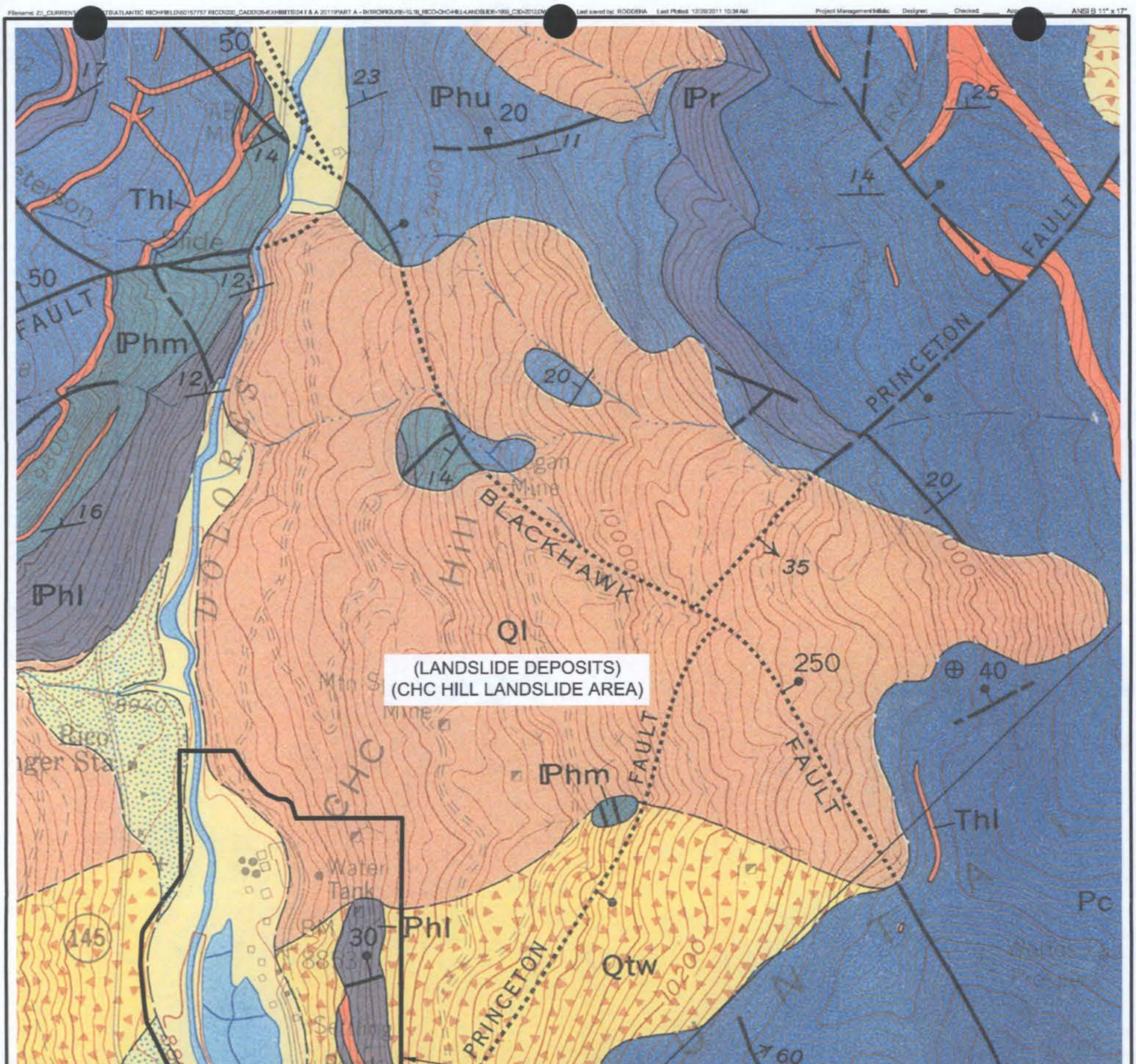
# RICO-ARGENTINE SITE-OU01

CHC HILL LANDSLIDE AREA - PHOTOINTERPRETATION / FIELD RECONNAISSANCE 2011

FIGURE 10.1A

AECOM

60157757



# RICO-ARGENTINE SITE-OU01

CHC HILL LANDSLIDE AREA - PUBLISHED MAPPING 1969

FIGURE 10.1B

AECOM

60157757

# PHOTOS

**Photo 4.1** – Caterpillar 308C CR "Mini-Excavator", TP2011-3

**Photo 4.2** – Caterpillar 330C "Long-Stick" excavator, TP2011-2


**Photo 4.3** – Caterpillar 330C excavator, TP2011-15


**Photo 4.4** – Boart-Longyear C 100 "Mini-Sonic" Drill Rig, MW-3D

**Photo 6.1** – Gregg 20-ton track mounted rig (outside)

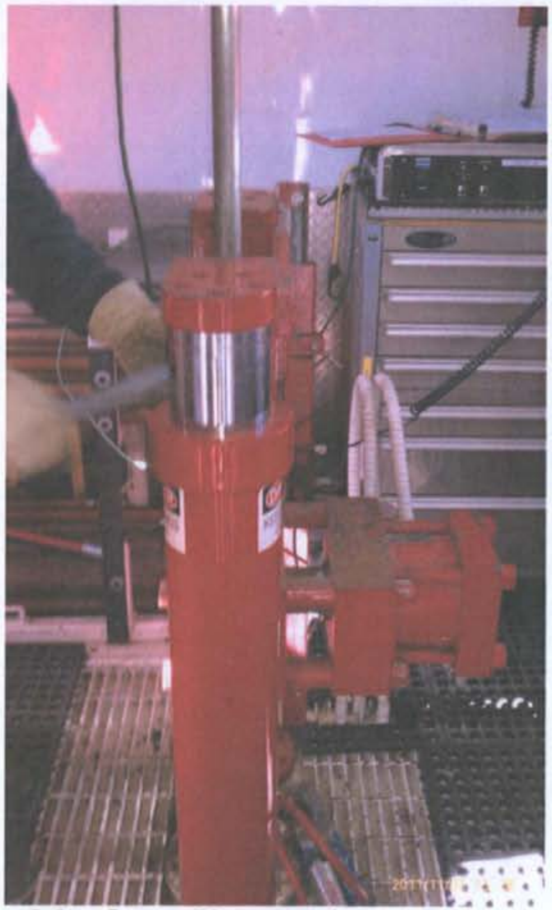


**Photo 6.2** – Gregg 20-ton track mounted rig (inside)

Photo 10.1 – TP2011-4 pit excavation

Photo 10.2 – TP2011- 5, 3' to 5'

Photo 10.3 – TP2011-21 alluvium beneath Pond 18

Photo 10.4 – ED-2 10'-12' alluvium

**Photo 10.5** – PDF-1, 40' – 50'

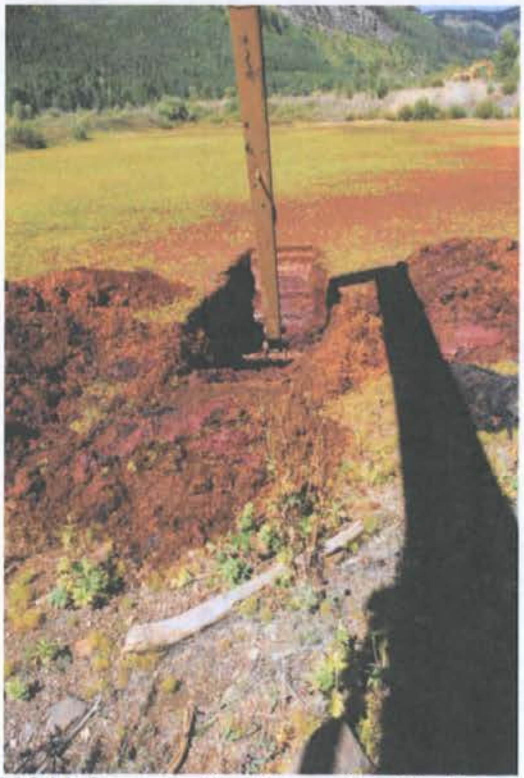


**Photo 10.6** – TP2011-2 excavation through solids (orange material) and calcines (purple material)

Photo 10.7 – Spoil pile, TP2011-8

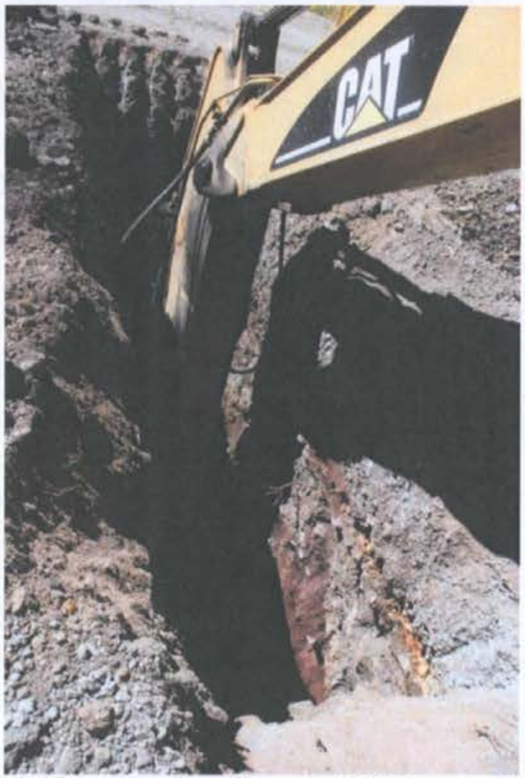


Photo 10.8 – TP2011-16 excavation, liner and thin layer of orange solids visible at lower right

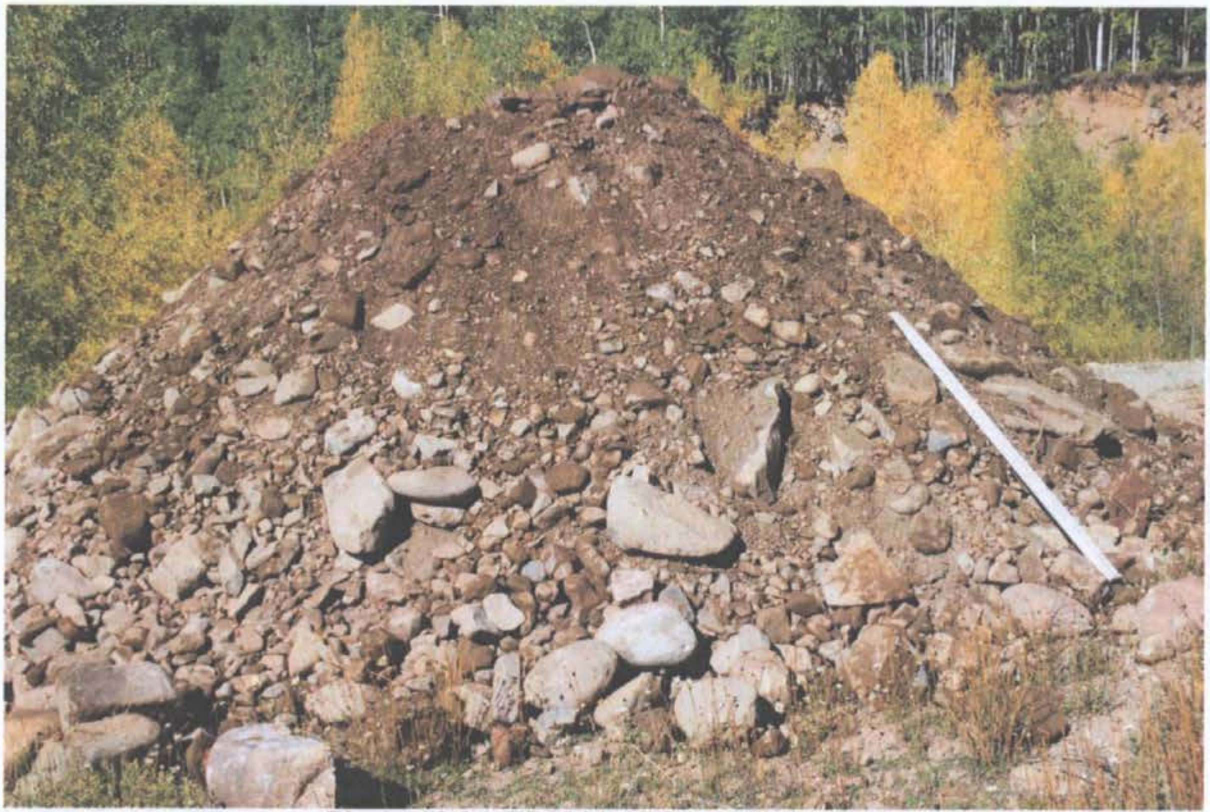


**Photo 10.9** – TP2011-15 2' to 10' spoil pile

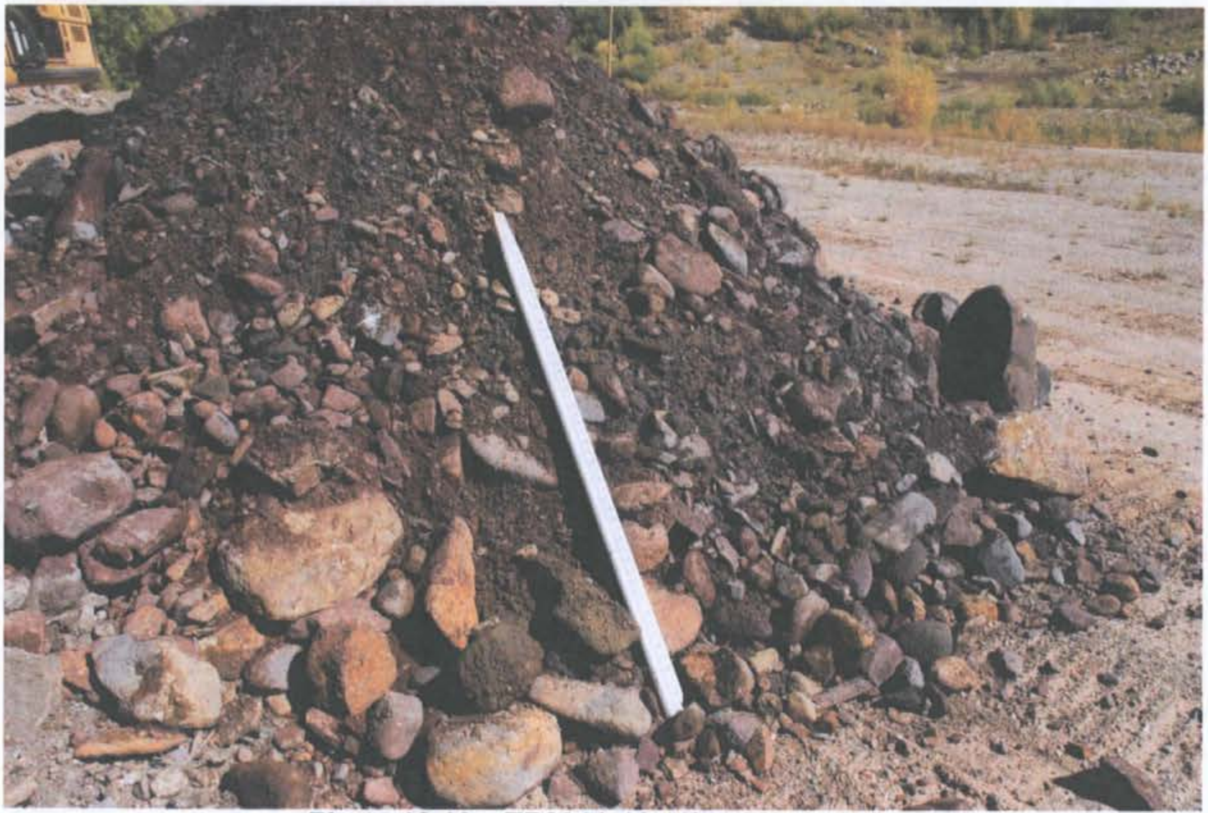


**Photo 10.10** – TP2011-16 10' to 20' spoil pile


Photo 10.11 – TP2011-15 10' to 16' spoil pile


Photo 10.12 – Undated photo depicting demolition of former acid plant in NSR area

**Photo 10.13** – Undated photo depicting demolition of former acid plant in NSR area

**Photo 10.14** – TP2011-14 0' to 18' spoil pile

**Photo 10.15** – TP2011-13 0' to 18' spoil pile

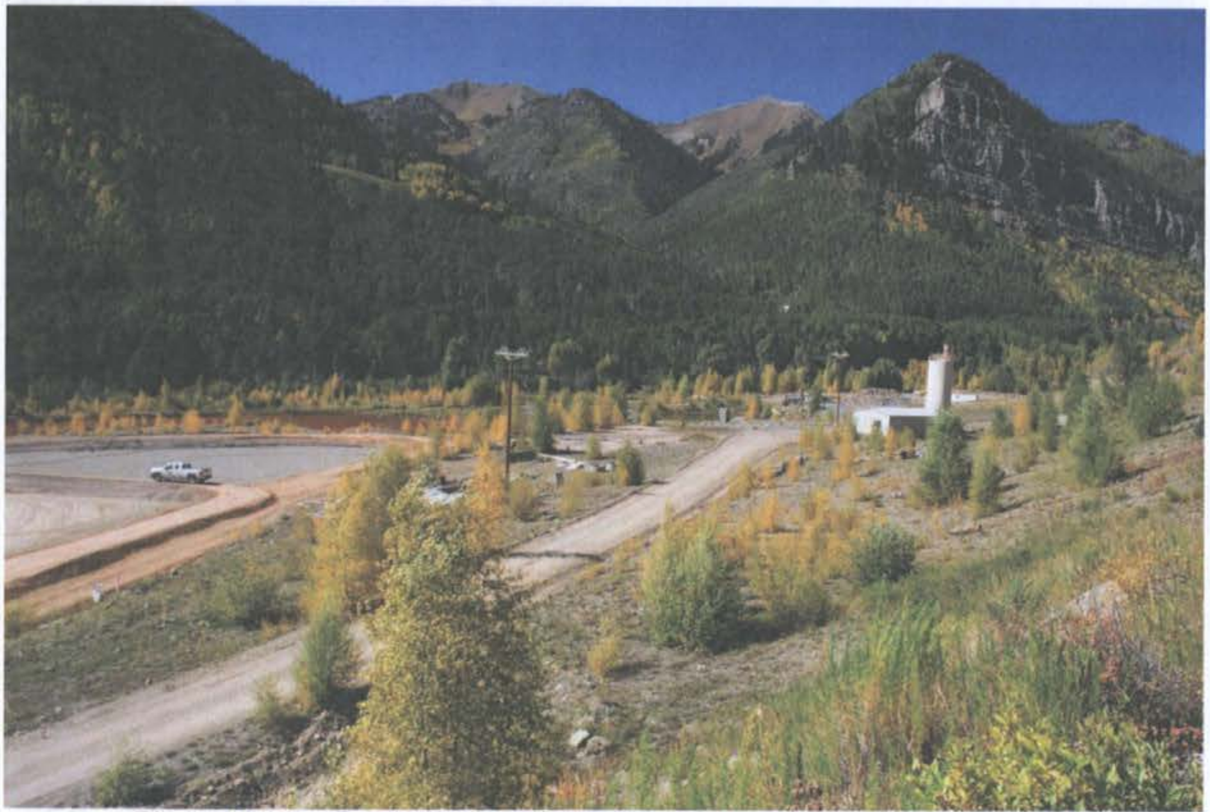


**Photo 10.16** – South Stacked Repository (SSR) Area, looking northwest

**Photo 10.17** – TP2011-17 0' to 20' spoil pile

**Photo 10.18** – View to the northeast of active landslide area

# APPENDICES

## Appendix A1 – Test Pit and Boring Logs

2011 Boring Logs
2011 Test Pit Logs
Prior Field Exploration Logs

## Appendix A2 – Geotechnical Laboratory Testing Results

2011 Laboratory Data
Prior Laboratory Data

## Appendix A3 – CPT Logs

## Appendix A4 – Refraction Microtremor (ReMi) Profiles

# APPENDIX A1

# BORING AND TEST PIT LOGS

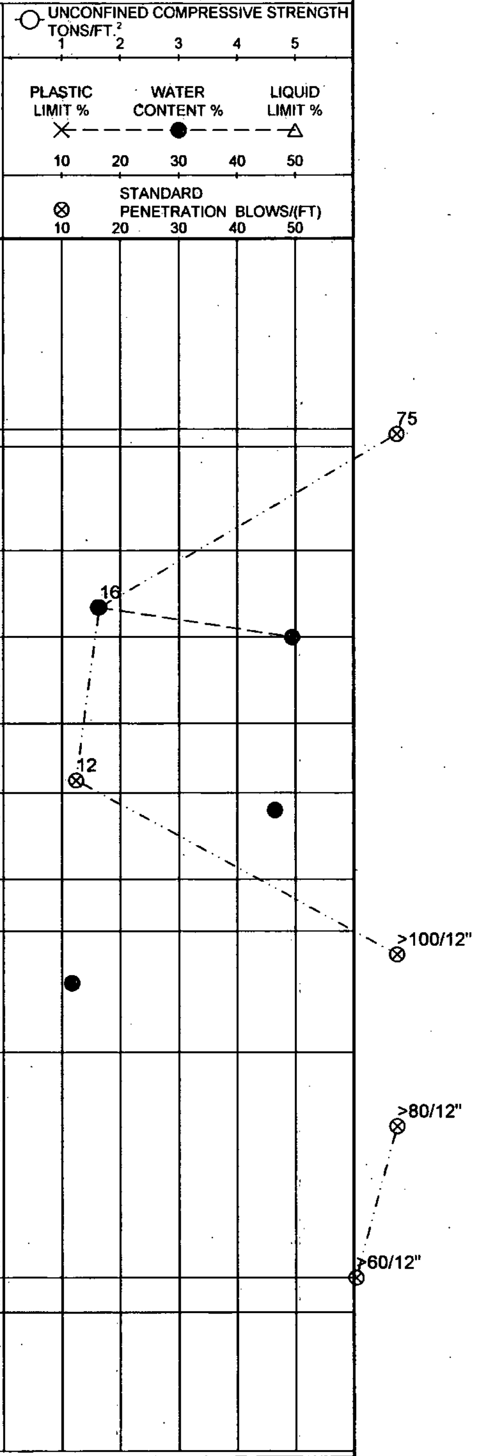
# 2011 Boring Logs

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ADF/R1** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,843.9 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.³ |
|---|---|---|---|---|---|---|---|
| | | 1 | SS | | | FILL - Silty GRAVEL (GM) - moist - grayish - angular rock fragments<br>*NOTE: Laydown yard has been reworked with excavating equipment | |
| | | | PA | | | | |
| 5.0 | | | | | | 5.5 | |
| | | 2 | SS | | | 6.0 FILL - Silty SAND (SM), fine to medium - extremely dense - moist<br>>60 blows 6-12" at 5.5' | |
| | | | PA | | | 9.0 FILL - Silty GRAVEL (GM), mostly pebble gravel - moist - grayish - angular rock fragments - grades tan, brown | |
| 10.0 | | | | | | FILL - Mine spent ore - well graded sand sized (SW) - medium dense - dry - burgundy and white | |
| | | 3 | SS | | | 11.5 | |
| | | | PA | | | FILL - Calcines - sand and silt sized (SM) - moist<br>14.0 | |
| 15.0 | | | | | | FILL - Spent ore - well graded SAND (SW) - medium dense - moist - burgundy and trace white | |
| | | 4 | SS | | | 16.0 | |
| | | | PA | | | FILL: Calcines - sand and silt sized (SM) - wet<br>18.5 | |
| 20.0 | | | | | | FILL - Silty GRAVEL (GM), Cobbles - moist - light brown with 4.0" layer stained yellow<br>20.0 | |
| | | 5 | SS | | ▼ | FILL - Calcine tailings - sand and silt sized (GM) - extremely dense - wet | |
| | | | PA | | | 23.5 | |
| 25.0 | | | | | | ALLUVIUM - Silty GRAVEL (GM) - angular to subrounded cobbles up to 5" diameter - extremely dense - wet - flowing 25.0'-27.0' then increasing clay down to 30.0' - wet at 30.0' but not flowing | |
| | | 6 | SS | | | | |
| | | | PA | | | | |
| 30.0 | | | | | | 30.0 | |
| 31.0 | | 7 | SS | | | 31.0 ALLUVIUM - Silty GRAVEL (GM) - angular to subrounded cobbles up to 5" diameter - wet - increasing clay down to 31.0' - wet at 31.0' but not flowing (GM) | |
| | | | | | | End of Boring<br>Boring logged by: L. Beem<br>Casing: 7.0" I.D. Sonic | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

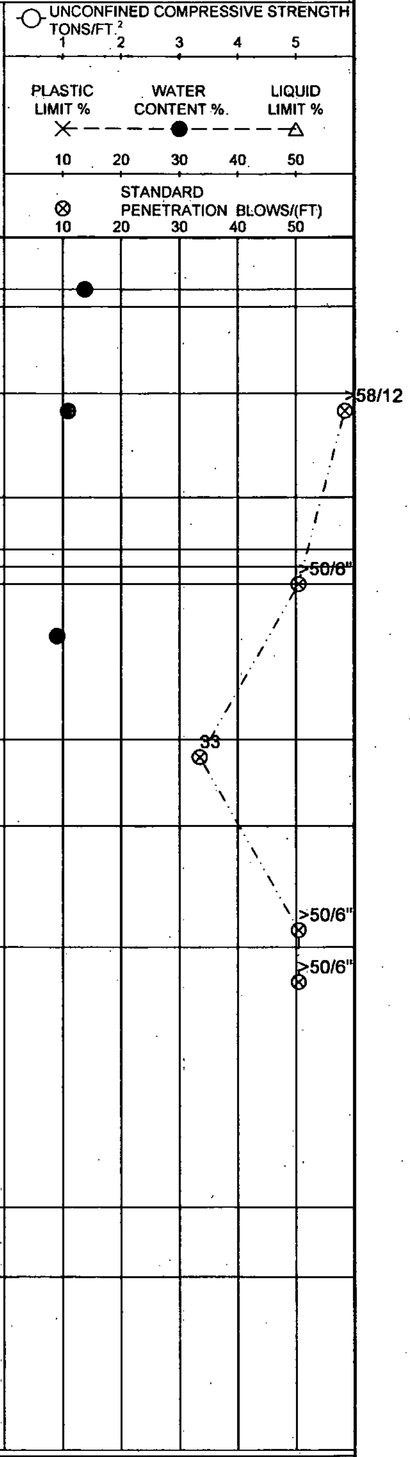
| | | | |
|---|---|---|---|
| NORTHING 1389466 | BORING STARTED 10/2/11 | AECOM OFFICE Denver | |
| EASTING 2267869 | BORING COMPLETED 10/2/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 21.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ADF/R2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,842.7 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | STRATUM DEPTH | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|
| | 1 | SS | 1.5 | FILL - Silty GRAVEL (GM), pea gravel size and stained - moist - black | |
| | | | 2.0 | FILL - Sandy SILT (SM), coarse sand size fragments of hermosa - moist - black with red | |
| | | PA | 4.5 | FILL - Silty CLAY (CL/CH) with some Pebble-Cobble fragments and Gravel - moist - brown - liner in core at 3.0', rubber | |
| 5.0 | 2 | SS | 7.5 | FILL - Calcines (SM) 4.5-7.5' - calcines increasing clay with depth trace fine gravel - extremely dense | |
| | | PA | 9.0 | FILL - WOOD debris mixed with Silt and trace Clay - decomposition odor | |
| | | | 9.5 | FILL - Well graded SAND (SW), medium to coarse - wet to saturated | |
| 10.0 | | | 10.0 | FILL - Silty GRAVEL (GM) - angular gravel - extremely dense - saturated | |
| | 3 | SS | | | |
| | | PA | 14.5 | FILL - Silty GRAVEL (GM), trace Clay, increasing Clay down - angular and subrounded cobble up to 7" in diameter - wet | |
| 15.0 | 4 | SS | 17.0 | FILL - Well graded GRAVEL (GW), with fine to coarse Sand - angular and subrounded 1-2" minus - dense - saturated - wire and piece of timber | |
| | | PA | 20.5 | ALLUVIUM - Silty GRAVEL (GM) with trace Clay - mostly subrounded cobbles up to 5" in diameter - extremely dense - wet not saturated | |
| 20.0 | 5 | SS | | Well graded GRAVEL (GM) with fine to coarse Sand - subrounded cobbles up to 6" diameter- saturated | |
| 25.0 | | PA | 28.0 | Increasing Silt to 28.0' | |
| | | | 30.0 | Silty GRAVEL (GM) with fine to coarse Sand - angular and subrounded cobbles up to 5" diameter - wet | |
| 30.0 | | | | End of Boring<br>Backfilled with bentonite chips to gravel surface (8 bags)<br>Hole caved below 20.0'<br>Boring logged by: L. Beem<br>Casing: 7.0" I.D. Sonic | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1389765 | BORING STARTED 10/2/11 | AECOM OFFICE Denver | |
| EASTING 2267877 | BORING COMPLETED 10/2/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 7.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **AT-2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

-○- UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

SURFACE ELEVATION +8,866.2 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|---|
| | | | | | | ▨ | Talus slope wash, colluvium, boulders up to 8.0' diameter visible on surface | |
| 5.0 | | | | | | ▨ | | |
| 10.0 | | | | | | ▨ 13.0 | | |
| 15.0 | | | | | | 16.0 | VOID - Drill stem advanced with no down pressure | |
| | | | | | | ▨ 19.0 | Colluvium | |
| 20.0 | | | | | | | Encountered tunnel at 19.0' at a 32 degree angle boring. Drill stem advanced under very little down pressure. | |
| 25.0 | | | | | | 25.0 | | |
| | | | | | | ▧ 26.5 | Encountered railroad rail, tie and ballast rock from 25.0-26.5' in core barrel - Possible Bedrock | |
| | | | | | | | Trip out change to HQ core.<br>Continue as rock log below 25.0'. | |
| 30.0 | | | | | | | | |
| 35.0 | | | | | | | | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1389126 | BORING STARTED | AECOM OFFICE Denver | |
| EASTING 2268406 | BORING COMPLETED | ENTERED BY KKB | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN / | APP'D BY | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **AT-2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | | SURFACE ELEVATION **+8,866.2 Feet** |

| | | DRILLING | | | | LITHOLOGY | | DISCONTINUITY | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH(FT) | ELEVATION(FT) | RUN NO. | CORING TIME, MIN/FT (AVG) | RECOVERY, % | RQD, % | GRAPHIC | VISUAL DESCRIPTION AND REMARKS | FRACTURE FREQUENCY (BREAK/FT) | DEPTH, FT | DIP, DEG | TYPE | APERTURE | INFILL | AMOUNT | SHAPE | ROUGHNESS |
| 25.0 | | Run No. | | | | | Rock core log continued from soil boring log at 25.0'<br>25 | | | | | | | | | |
| | | Run No. | | | | | 26.5 Encountered railroad rail, tie and ballast rock in core barrel | | | | | | | | | |
| 30.0<br>35.0 | | Run No. | | | | ▨ | Bedrock or rock present from 26.5-35.0', Latite porphyry (intrusive rock)<br>No significant recovery<br>35 | | | | | | | | | |
| | | | | | | | End of boring at 35.0' (drilled at 32 degrees horizontal)<br>Core logged by : L. Beem<br>T.O. Casing EL. 8866.21 | | | | | | | | | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1389126 | BORING STARTED | AECOM OFFICE **Denver** | |
| EASTING 2268406 | BORING COMPLETED | ENTERED BY KKB | SHEET NO. 1 OF 1 |
| WL (DEPTH) | RIG/FOREMAN / | APP'D BY | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **BAH-01** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,912.6 Feet | UNIT DRY WT. LBS./FT.$^3$ | ○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5<br>PLASTIC LIMIT % ✕ WATER CONTENT % ● LIQUID LIMIT % △ 10 20 30 40 50<br>⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Cobbles, silt, sand - drilling mud: brown-red brown<br>Angle boring at 13 degrees from horizontal | | |
| 5.0 | | | | | | | | |
| 10.0 | | | | | | Easy drilling - drill mud brown | | |
| 15.0 | | | | | | | | |
| 17.0 | | | | | | Cobbles, boulders - drill mud brown with multiple rock type fragments | | |
| 20.0 | | | | | | | | |
| 25.0 | | | | | | Easy drilling - drill mud brown with red ss, gray ls and others. | | |
| 30.0 | | | | | | Boulder | | |
| 34.0 | | | | | | Cobbles, boulders - easy drill - drill mud brown | | |
| 35.0 | | | | | | Moderate drill - drill mud brown | | |
| 40.0 | | | | | | | | |

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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 1 OF 4

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **BAH-01** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ | ○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5<br>PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50<br>⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | SURFACE ELEVATION +8,912.6 Feet (Continued) | | |

41.0 Boulder - moderate drill - drill mud brown

Cobbles, boulders

45.0

50.0

50.0 Boulder - drill mud brown-red brown - multiple rock fragment types

53.0 Cobbles, boulders - easy drill

55.0

55.0 Boulder

56.0 Cobbles, boulders - easy drill

60.0

60.0 Boulder - drill mud brown - multiple rock fragment types

64.0 Cobbles, boulders

65.0

Lost circulation at 65.0'

Easy drill - some cobbles

70.0

75.0

80.0

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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | |
|---|---|---|
| The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual. | AECOM JOB NO. 60157757 | SHEET NO. 2 OF 4 |

AECOM

| | | | |
|---|---|---|---|
| CLIENT | **Atlantic Richfield Company** | LOG OF BORING NUMBER | **BAH-01** |
| PROJECT NAME | **Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER | **Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT) ⊗ 10 20 30 40 50

UNIT DRY WT. LBS./FT.$^3$

DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY

DESCRIPTION OF MATERIAL

SURFACE ELEVATION +8,912.6 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | DESCRIPTION OF MATERIAL |
|---|---|---|
| | 1 | Cobbles, boulders |
| 85.0 | | 85.0 Hard boulder - drill mud brown-red brown - multiple rock type fragments |
| | | 88.0 Cobbles, boulders - moderate drilling |
| 90.0 | | |
| 95.0 | | |
| 100.0 | | Circulation 100.0-104.0' - drill mud brown-red brown |
| 105.0 | | Relatively easy drilling |
| 110.0 | | |
| | 2 | |
| 115.0 | | |
| 120.0 | | |

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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 3 OF 4

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **BAH-01** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

-O- UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ – – – WATER CONTENT % ● – – – LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

SURFACE ELEVATION +8,912.6 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| to 124.0 | | | | | | Cobbles, boulders - moderate drilling | |
| 125.0 | | | | | | | |
| 124.0 – 127.0 | | | | | | Boulder - circulation restored - drill mud brown-red brown - multiple rock types in mud | |
| 127.0 – 137.0 | | | | | | Cobbles, boulders - easy drilling | |
| 130.0 | | | | | | | |
| | | 3 | | | | | |
| 135.0 | | | | | | | |
| 137.0 – 145.0 | | | | | | Boulder - circulation returns drill mud brown-red brown - multiple rock types in mud | |
| 140.0 | | | | | | | |
| 145.0 | | | | | | | |
| 145.0 – 147.0 | | | | | | Drill mud changed to gray-green - mineralogy appears consistent with latite, no other rock fragments present. | |
| 147.0 | | | | | | Drill mast and front of rig lift off the ground, driller backed off down pressure, rig sets back to original location. Driller notes possible bedrock at 147.0'. Drill mud appears to contain latite fragments, no others. Drilled about 6.0" into rock | |
| 150.0 | | | | | | Remove drill string 10/31/2011 (broken roller bit) | |
| | | | | | | Replace HWT with core bit and redrill to 147.0' | |
| 155.0 | | | | | | Over burden logged by L. Beem. | |
| | | | | | | Continued as rock core log below 147.0'. | |
| 160.0 | | | | | | | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388951 | BORING STARTED 10/26/11 | AECOM OFFICE Denver | |
| EASTING 2268365 | BORING COMPLETED 11/9/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL | RIG/FOREMAN / | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **BAH-01** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | | SURFACE ELEVATION **+8,912.6 Feet** |

| DEPTH(FT) | ELEVATION(FT) | DRILLING | | | | LITHOLOGY | | DISCONTINUITY | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RUN NO. | CORING TIME, MIN/FT (AVG) | RECOVERY, % | RQD, % | GRAPHIC | VISUAL DESCRIPTION AND REMARKS | FRACTURE FREQUENCY (BREAK/FT) | DEPTH, FT | DIP, DEG | TYPE | APERTURE | INFILL | AMOUNT | SHAPE | ROUGHNESS |
| 145.0 | | Run No. | | | | 147 | Rock core log continued from soil boring log at 147.0' | | | | | | | | | |
| 150.0 | | Run No. | | | | 153 | Cored to 153.0' - recovered few rock fragments of colluvial material. Switch back to HWT casing. No drill fluid return. | | | | | | | | | |
| 155.0<br>160.0 | | | | | | 160 | Fragments of sandstone, shale and latite porphyry (Colluvium)<br>156.0' - Fluid returns - medium green gray | | | | | | | | | |
| | | Run No. | | 37 | 20 | 163 | Fragments of greenstone, quartz vein, sandstone (Colluvium) - hard - largest clast 0.8' - switch to HQ3 to sample/drill through block - angle of rods 15 degrees - core barrel stuck tripped drill string | | | | | | | | | |
| 165.0<br>170.0<br>175.0 | | Run No. | | | | 178 | Variable hard and soft drilling - advanced HWT casing with shoe bit - medium brown drill fluid returns<br>174.0' - Add 10.0' feet of casing - reem/no sample<br>177.0' - Quartzite, light gray, unfractured, hard, strong - possible boulder<br>177.17' - Drilling hard - return fluids change color to dark gray - switch to coring | | | | | | | | | |
| 180.0 | | Run No. | | 62 | 32 | 183 | Fines (matrix) wash out during drilling - cored 178.0-183.0' - hard and soft zones - returns varied light gray (hard drilling) to dark dirty | | | | | | | | | |

. . . continued

The stratification lines represent the approximate boundary lines between soil/rock types: in situ, the transition may be gradual.

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **BAH-01** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | | SURFACE ELEVATION **+8,912.6 Feet** |

| DEPTH(FT) | ELEVATION(FT) | DRILLING: RUN NO. | DRILLING: CORING TIME, MIN/FT (AVG) | DRILLING: RECOVERY, % | DRILLING: RQD, % | LITHOLOGY: VISUAL DESCRIPTION AND REMARKS | DISCONTINUITY: FRACTURE FREQUENCY (BREAK/FT) | DEPTH, FT | DIP, DEG | TYPE | APERTURE | INFILL | AMOUNT | SHAPE | ROUGHNESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 185.0 | | Run No. | | | | brown (soft drilling)<br>186 "Soft" smooth drilling no cuttings/fluid return - trip HQ rods advance HWT casing through colluvium, no returns | | | | | | | | | |
| | | Run No. | | 98 | 60 | 185.42' - Drilling becomes hard, switch to HQ3 core | | | | | | | | | |
| 190.0 | | Run No. | | 80 | 40 | 190<br>190.5 Sandstone, light green gray, massive, hard, moderately strong, fine grained<br>189.17' - Dark gray siltstone, closely fractured, moderately hard, weak, grades to s.s. | | | | | | | | | |
| 195.0 | | Run No. | | 41 | 12 | Medium dark gray limestone closely fractured<br>Drill/core to 193.0' and pull drill string<br>Sandstone and siltstone with medium brown sandy clay matrix - variable hard to soft drilling - most | | | | | | | | | |
| 200.0 | | Run No. | | 78 | 20 | 200 fines (matrix) washing out<br>193.42' - Drilling becomes variably hard, soft zones encountered<br>198-58' - Latite porphyry - light green gray, medium grained with pyrite stringers to veinlets | | | | | | | | | |
| 205.0 | | Run No. | | 76 | 0 | 205 No circulation<br>Wash out from 200.0-202.33'<br>202.33' - Latite porphyry, medium bluish gray (5B 5/1), hard, moderately strong with feldspars to 0.25"<br>209.58 204.5' - Shale, medium to dark gray (N3.5), hard, weak, closely fractured. | | | | | | | | | |
| 210.0 | | Run No. | | 82 | 20 | Colluvium consists of mixture of sandstone, shale, arkose with red siltstone<br>Fine grained matrix wash out - clast range from 0.4'-0.5" | | | | | | | | | |
| 215.0 | | Run No. | | 67 | 0 | Altered sandstone - medium greenish gray, fine grained, with apparent relic beds or cross bed at 25 degrees to axis of core - moderately fractured, moderately hard, weak with pyrite and quartz along fracture surfaces (up to 0.25") | | | | | | | | | |
| 220.0 | | Run No. | | 77 | 0 | 220.5 214.5' - Small fault zone<br>Possible bedrock at 215.0'<br>Closely fractured | | | | | | | | | |

. . . continued

|  |  |  |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **BAH-01** |
|  | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION |  | SURFACE ELEVATION **+8,912.6 Feet** |

| DEPTH(FT) | ELEVATION(FT) | DRILLING: RUN NO. | DRILLING: CORING TIME, MIN/FT (AVG) | DRILLING: RECOVERY, % | DRILLING: RQD, % | LITHOLOGY: GRAPHIC | LITHOLOGY: VISUAL DESCRIPTION AND REMARKS | DISCONTINUITY: FRACTURE FREQUENCY (BREAK/FT) | DEPTH, FT | DIP, DEG | TYPE | APERTURE | INFILL | AMOUNT | SHAPE | ROUGHNESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 225.0 |  | Run No. |  | 100 | 38 | 224.25 | Shear zone - siltstone dark green gray, closely fractured with light gray gouge along fractures. Loss circulation, core blocked, stop trip at 220.5' - switch back to 5.0' core barrel for recovery Good circulation through 5.0' run - NQ rods at 15.5 to horizontal degrees at surface |  |  |  |  |  |  |  |  |  |
| 230.0 |  | Run No. |  | 34 | 0 | 230<br>231 | Siltstone, medium dark gray (N3.5), hydrothermally alt., finely dissim. pyrite, closely fractured with quartz veins and veinlets 0.063-.125" , moderately hard, weak to moderate;y strong. |  |  |  |  |  |  |  |  |  |
| 235.0 |  | Run No. |  | 96 | 0 | 235.2 | Quartz vein, white to light gray (N9-N7), with vugs Lost circulation<br>Shear zone with fault gouge, intensely fractured |  |  |  |  |  |  |  |  |  |
| 240.0 |  | Run No. |  | 20 | 0 | 240 | Sandstone/siltstone, medium dark gray (N4/5), sandstone very fine grained grades at 238.0' to siltstone, closely fractured, moderately hard, weak with pockets of pyrite and quartz to 0.25" |  |  |  |  |  |  |  |  |  |
| 245.0 |  | Run No. |  |  |  |  | 240.0-252.0' - VOID - pushed rods with no resistance except for apparent slough zone when lowered rods to 244.0' to advance another 5.0'. Pushed back through void from 246.0-252.0'. Assume one continuous void (St. Louis Tunnel) |  |  |  |  |  |  |  |  |  |
| 250.0 |  | Run No. |  |  |  | 252 |  |  |  |  |  |  |  |  |  |  |
| 255.0 |  | Run No. |  |  |  |  | Drill stem appeared to be following tunnel; at risk of losing core barrel terminated drilling hole after 12.0' of void. |  |  |  |  |  |  |  |  |  |
| 260.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

|  |  |  |  |
|---|---|---|---|
| NORTHING 1388951 | BORING STARTED 10/26/11 | AECOM OFFICE Denver |  |
| EASTING 2268365 | BORING COMPLETED 11/9/11 | ENTERED BY SJH | SHEET NO. 3 OF 3 |
| WL (DEPTH) | RIG/FOREMAN / | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

CLIENT
**Atlantic Richfield Company**

LOG OF BORING NUMBER **ED-1**

PROJECT NAME
**Rico-Argentine Site - OU01**

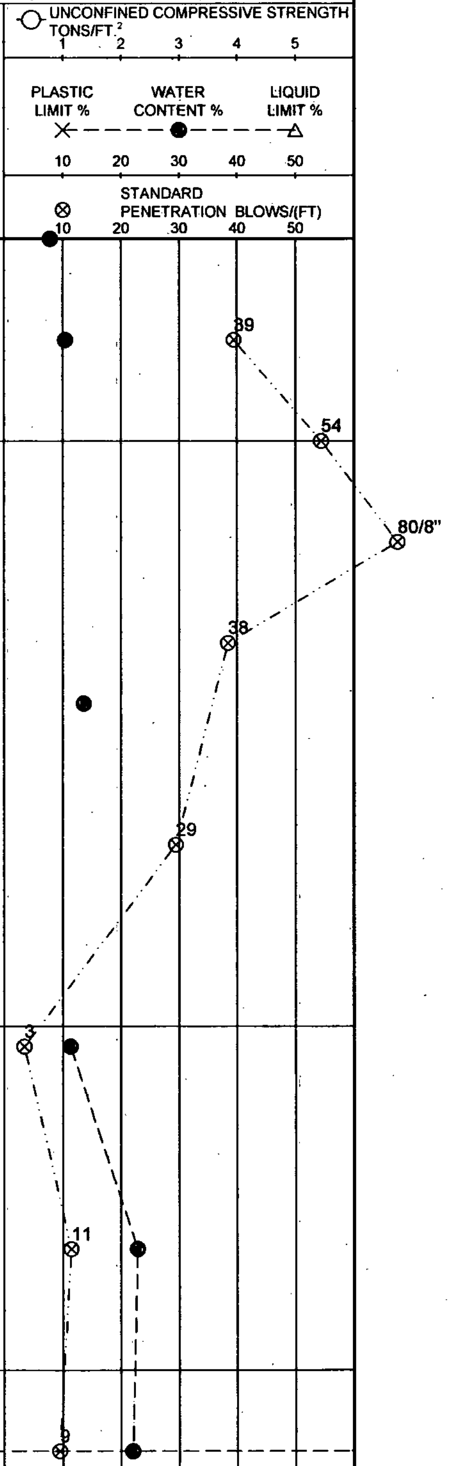
ARCHITECT-ENGINEER
**Drilling Company: Boart Longyear**

SITE LOCATION

SURFACE ELEVATION +8,785.0 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|---|
| | | | GB | | | | FILL - Clayey Sandy GRAVEL (GC) - approximately 40% gravel and larger, 40% sand and 20% fines - mostly subangular to angular gravel - fines moderately plastic - dark brown 5YR 3/3 - dry to 6.0" and then moist - dense to very dense | |
| | | 1 | GB | | | | | |
| 5.0 | | | GB | | ▼ | 5.0 | Black ORGANIC (OL) layer at 4.0' with decayed roots and organic smell<br>Becomes wet at 4.5' | |
| | | 2 | GB | | | | ALLUVIUM - Silty Sandy Cobbly GRAVEL (GW-GM) - approximately 60% gravel and larger, 30% sand and 10% fines - subrounded to rounded gravel - extremely dense to medium dense - fines non-plastic - brown 10YR 4/3 | |
| | | | GB | | | | | |
| | | 3 | GB | | | | Note: Alluvium contact set at 5.0' instead of 4.0' due to angularity of particle and nature of fines, however, 4.0' is where alluvium "should" be based on height of dike and organic layer. | |
| 10.0 | | | GB | | | | | |
| | | 4 | GB | | | | Grades to Clayey Gravelly SAND (SC) at 10.0' with some subangular to angular particles - approximately 35% gravel, 40% sand and 25% fines | |
| | | | GB | | | | | |
| 15.0 | | 5 | GB | | | | Grades to Sandy GRAVEL (GW) at 15.0' - predom. rounded to subrounded with some subangular | |
| | | | GB | | | | 5.0' heave in casing - adding water to casing at 17.5' | |
| 20.0 | | 6 | GB | | | 19.5 | ALLUVIUM - Silty fine SAND (SM) - non-plastic fines - loose to medium dense - reddish brown 5YR 4/4 | |
| | | | GB | | | | | |
| 25.0 | | 7 | GB | | | | Grades to dark yellowish brown 10YR 4/6 at 24.5' | |
| | | | GB | | | 28.0 | ALLUVIUM - Silty fine SAND (SM) - low-plasticity fines - loose to medium dense - dark yellowish brown 10YR 4/6 | |
| 30.0 | | | | | | | | |

. . . continued



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 1 OF 4

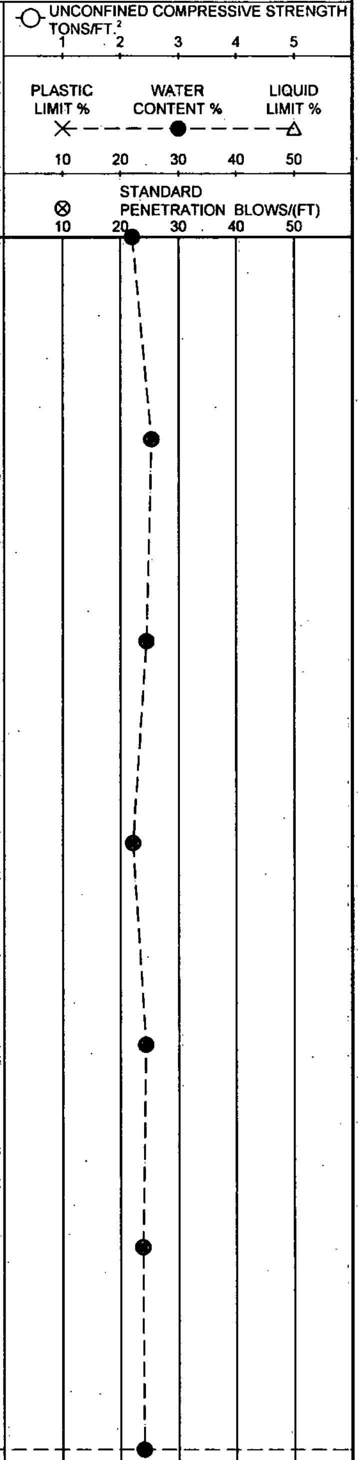
AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-1** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,785.0 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.³ |
|---|---|---|---|---|---|---|---|
| | | 8 | GB | | | ALLUVIUM - Silty fine SAND (SM) - low-plasticity fines - loose to medium dense - dark yellowish brown 10YR 4/6<br>Sample 8: Inadvertently disposed of sample | |
| | | | GB | | | | |
| | | | GB | | | | |
| 35.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 40.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 45.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 50.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 55.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 60.0 | | | | | | | |



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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 2 OF 4

| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-1** |
|---|---|---|
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

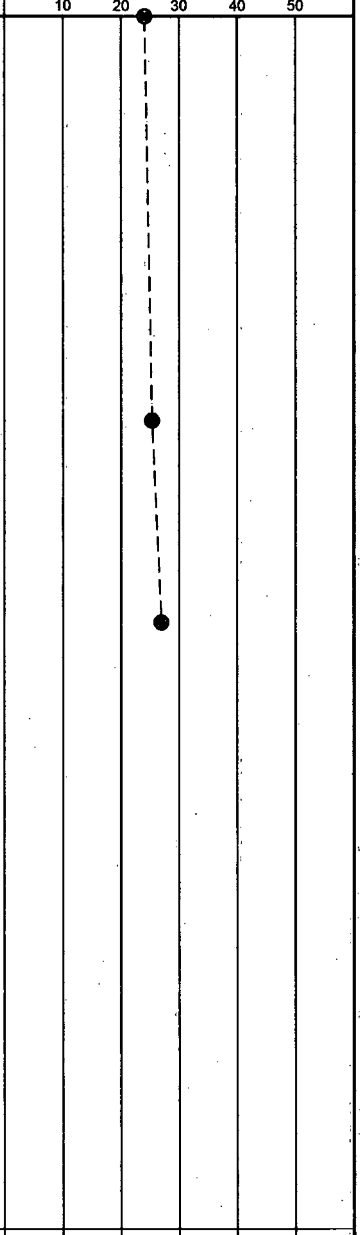
○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — — WATER CONTENT % ● — — LIQUID LIMIT % △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

SURFACE ELEVATION +8,785.0 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | | | | ALLUVIUM - Silty fine SAND (SM) - low-plasticity fines - loose to medium dense - dark yellowish brown 10YR 4/6<br>Driller reports loss of sample from casing - switching to "flap bit"<br>Noticeably finer, higher silt content, possibly some clay fines, slightly more plastic | |
| 65.0 | | | GB | | | | |
| 70.0 | | | | | | Becomes reddish brown 7YR 4/4 | |
| | | | GB | | | Transitions back to typical 28.0-60.0' material | |
| | | | GB | | | | |
| 75.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 80.0 | | | | | | | |
| | | | GB | | | | |
| | | | GB | | | | |
| 85.0 | | | | | | | |
| | | | GB | | | | |
| 90.0 | | | | | | 90.0 | |



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| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-1** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT.) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,785.0 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | | | | 91.0 Becomes firmer (soft) (SM-SC), higher clay content, slightly more plastic - thinly laminated layers (approx. 1/8" to 1/4") - dark bluish gray | |
| | | | GB | | | ALLUVIUM - Sandy Silty CLAY (CL) - 40% sand - moderately plastic - soft - reddish brown 5YR 4/4 - moist | |
| 95.0 | | | | | | | |
| | | | GB | | | | |
| 100.0 | | | GB | | | 100.0 | |

End of Boring
Backfilled with bentonite (22 bags)
Boring logged by: A. Jewell
Casing: 5.5" I.D.
Automatic hammer used for standard penetration tests

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

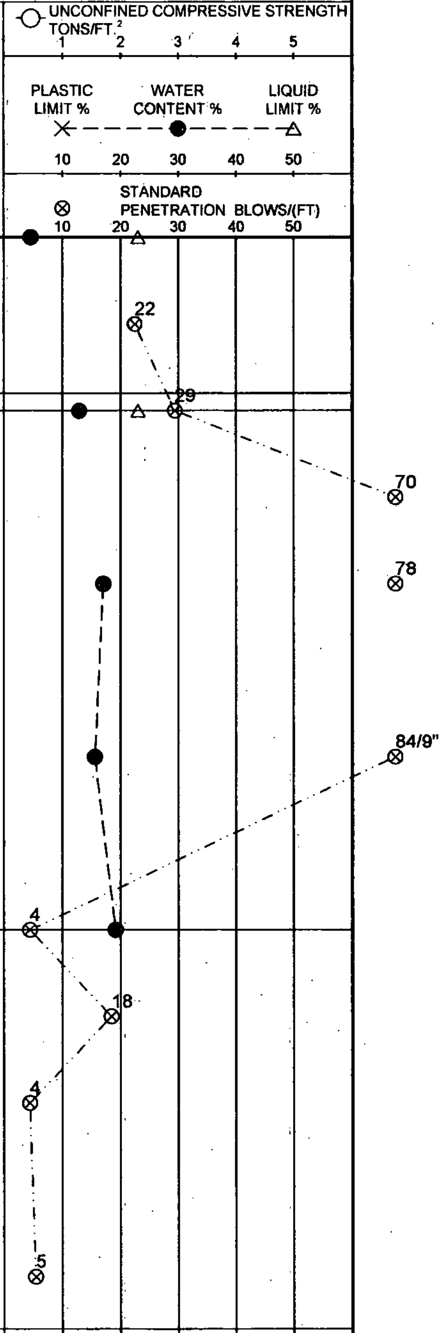
| | | | |
|---|---|---|---|
| NORTHING 1386848 | BORING STARTED 9/27/11 | AECOM OFFICE Denver | |
| EASTING 2267956 | BORING COMPLETED 9/28/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL 4.5' | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | | |
|---|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER | **ED-2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** | |

SITE LOCATION

SURFACE ELEVATION +8,790.7 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | Stratum depth | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|---|
| | | | GB | | | | FILL - Clayey Silty Sandy GRAVEL (GW) with cobbles up to 4.0" or greater - subangular to angular - approximately 60% gravel or larger, 30% sand and 10% fines - medium dense - dark brown 7.5YR 3/5 - dry to moist | |
| | | 1 | GB | | | | | |
| | | | GB | | ▼ | 4.5 | | |
| 5.0 | | | | | | 5.0 | Organic Cobbly Gravelly Silty SAND (SM-GM) - moderately plastic fines - subrounded to subangular gravel and cobbles - decayed roots - organic smell - medium dense - moist | |
| | | 2 | GB | | | | | |
| | | | GB | | | | Silty Sandy GRAVEL (GM-GP) and Cobbles - organic content from 5.0-7.0' - approximately 50% gravel and cobbles, 30% sand and 20% fines - gravel and cobbles subrounded to subangular up to 4.0" - fines moderately plastic - very dense - wet (GM-GP) | |
| | | 3 | GB | | | | Significant reduction in fines content (approx. 5%) at 7.5' (GW) | |
| 10.0 | | | GB | | | | | |
| | | 4 | GB | | | | Reduction in cobble content | |
| | | | GB | | | | | |
| 15.0 | | | | | | | | |
| | | 6 | GB | | | | | |
| | | | GB | | | | Change in color to dark yellowish brown 10YR 4/4 | |
| 20.0 | | | | | | 20.0 | No heave reported but sample recovery in core barrel is difficult | |
| | | 7 | GB | | | | ALLUVIUM - Silty fine SAND (SM) - non plastic - dark yellowish brown 10YR 4/4 - loose to medium dense - wet<br>Some coarse subangular to subrounded sand at 20.0'<br>Changes to dark reddish brown 5YR 4/3 at 22.0'<br>Subrounded to well rounded gravels up to 1.0" (<15%) at 22.5' | |
| | | | GB | | | | | |
| | | 8 | GB | | | | | |
| 25.0 | | | GB | | | | | |
| | | 9 | GB | | | | | |
| | | | GB | | | | | |
| 30.0 | | | | | | | | |
| 31.5 | | 10 | GB | | | 31.5 | | |
| | | | | | | | End of Boring<br>Backfilled with bentonite (9 bags)<br>Boring logged by: A. Jewell<br>Casing: 5.5" I.D.<br>Automatic hammer used for standard penetration tests | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387046 | BORING STARTED 9/28/11 | AECOM OFFICE Denver | |
| EASTING 2267985 | BORING COMPLETED 9/28/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 5.0' | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-3** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

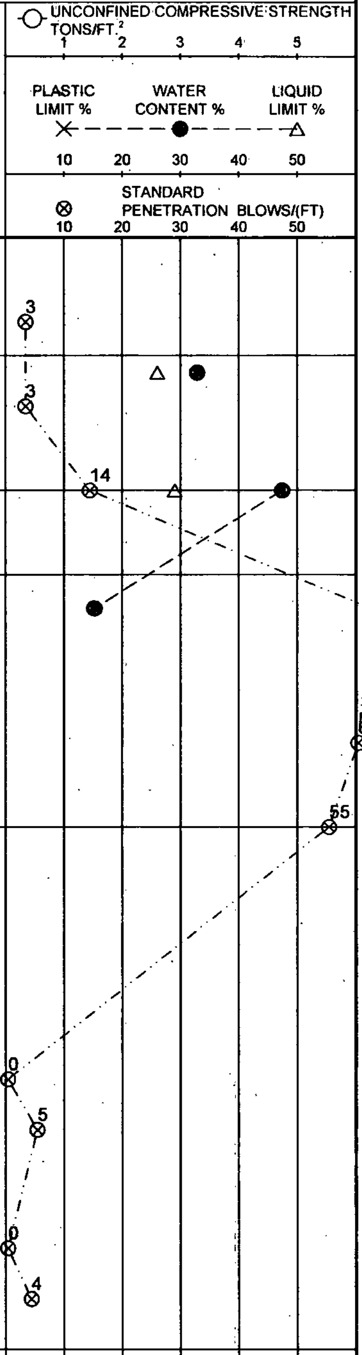
SITE LOCATION

DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY

DESCRIPTION OF MATERIAL

SURFACE ELEVATION +8,796.7 Feet

UNIT DRY WT. LBS./FT.³



| Depth (ft) | Sample No. | Sample Type |
|---|---|---|
| | | GB |
| | 1 | GB |
| 5.0 | | GB |
| | 2 | GB |
| | | GB |
| | 3 | GB |
| 10.0 | | GB |
| | 4 | GB |
| | | GB |
| 15.0 | 5 | GB |
| | | GB |
| | 6 | GB |
| 20.0 | | |
| | | GB |
| 25.0 | | |
| | 7 | GB |
| | 8 | GB |
| | | GB |
| 30.0 | | |
| | 9 | GB |
| | 10 | GB |
| 33.0 | | |

▼ 7.5

FILL - Silty Sandy Cobbly GRAVEL (GW) - approximately 50% gravel and above, 40% sand and 10% fines - cobbles to 4.0" - subangular to angular - dark reddish brown 10YR 4/3 - very loose - slightly moist
Transitions to <5% cobbles, 40% gravel, 40% sand and 20% fines at 2.0' - subrounded to subangular - dark reddish brown 5YR 2.5/2 - moist (GM)

FILL - Organic fine Sandy SILT (OL) - roots (decayed), wood debris (<1") possibly milled wood - scattered angular gravel - moderately plastic - black - very loose - moist to wet
At 5.5' cobbles, angular gravel, clumps of similar material as 0.0-1.5'
6.5-7.5' - Significant increase in medium to coarse angular sand content; becomes Silty Organic SAND (SM), scattered angular gravels up to 2.0", decayed plant fibers

ALLUVIAL OVERBANK - Organic Sandy SILT (ML-OL) - scattered coarse sand - moderately plastic - organic smell - black - medium dense - wet
Attempted to push shelby tube at 10.0', but bent

ALLUVIUM - Silty Sandy Cobbly GRAVEL (GM-GC) - approximately 50% gravel and above, 40% sand and 10 % fines - fines moderately plastic - cobbles to 4.0" - subrounded to subangular - very dense - very dark gray
Sample 4: No recovery
Approximately 20% fines and dark brown 7.5YR 3/2 from 12.5-15.0'
Transitions to Gravelly SAND (SW) - approximately 40% gravel, 50% sand and 10% fines - dark yellowish brown 10YR 4/4 - probable mix with unit below

ALLUVIUM - Silty fine SAND (SM) - non-plastic - scattered subrounded to rounded gravel - significant more gravel content that ED-1 or ED-2 - thin layers 4.0-5.0" of up to 50% gravel - gap graded - dark yellowish brown 10YR 4/4 - very dense - wet

Thin 4.0" medium or silty sand at 17.
Attempted shelby tube at 20.0' (bent)
Large cobble at 22.5'
22.5-30.0' - Absence of gravel and cobbles - gray low plasticity silty clay around 24.0' mixed with silty fine sand - reddish brown 7.5YR 4/3
Dark yellowish brown 10YR 4/4 tinges mixed with primary color from 25.0-27.5'
25.0 - Driller reports spoon sinking under it's own weight - run new sample with the same spoon at 26.5'
30.0 - Driller reports spoon sinking under it's own weight - run new sample with the same spoon at 31.5'

End of Boring
Backfilled with bentonite (9 bags)
Boring logged by: A. Jewell
Casing: 5.5" I.D.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387353 | BORING STARTED 9/29/11 | AECOM OFFICE Denver | |
| EASTING 2268007 | BORING COMPLETED 9/29/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 7.5' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-4** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$

SURFACE ELEVATION +8,810.2 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE |
|---|---|---|
| | | GB |
| | 1 | GB |
| 5.0 | | GB |
| | 2 | GB |
| | | GB |
| | 3 | GB |
| 10.0 | | GB |
| | 4 | GB |
| | | GB |
| | 5 | GB |
| 15.0 | | GB |
| | 6 | GB |
| | | GB |
| 20.0 | 7 | GB |
| | | GB |
| 25.0 | 8 | GB |
| | | GB |
| 30.0 | 9 | GB |
| 31.5 | | |

FILL - Clayey Silty Sandy Cobbly GRAVEL (GC-GM) - predom. angular to subangular gravel - approximately 40% gravel, 40% sand and 20% fines - fines moderately plastic - medium dense to dense - dark brown 10YR 3/4 - slightly moist
Thin calcine layer at 2.0'
Thin calcine layer at 3.0'

Scattered oxidized waste rock 7.5-9.0'

9.0-10.0' - Significant increase in gravel size -approximately 50% gravel, 40% sand and 10% silt - cobbles to 3.5" - reddish gray 10YR 5/1

Tending toward predom. subrounded gravel 12.0-14.0' - dark reddish brown
Rock in tip at 13.25'
Thin calcine layer at 14.0'

14.0

ALLUVIUM - Silty Sandy GRAVEL (GW) - approximately 60% gravel, 30% sand and 10% silt - subrounded to subangular gravel - medium dense to dense - reddish brown 5YR 4/3 - wet
Significant change in fines at 15.0' - approximately 20% clay, 40% sand and 40% gravel - fines moderate to high plasticity - cobbles to 4" - moist (GC)

Becoming wet

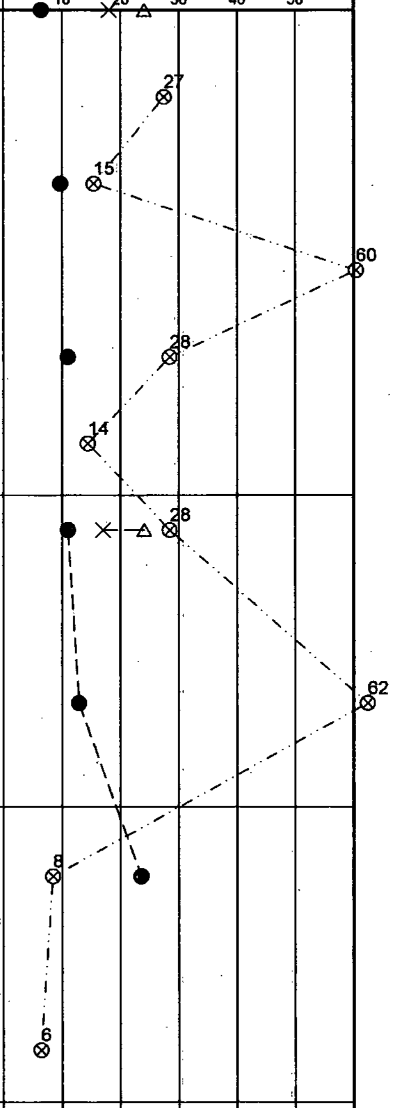
Large 5" cobble

23.0

ALLUVIUM - fine to medium grained SAND (SP), <5% Silt - scattered angular to well rounded gravel - dark reddish brown 5YR 4/3 - loose - moist to wet
24.0-25.0': Up to 30% gravel content and coarse sand - wet (SW)
25.0-26.0': No gravel - transitions to silty fine sand with <10% silt - yellowish red 5YR 4/6 (SM)
26.0-30.0': Transitions to <5% silt fines (SP)

31.5

End of Boring
Backfilled with bentonite (9 bags)
Boring logged by: A. Jewell
Casing: 5.5" I.D.



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387671 | BORING STARTED 10/2/11 | AECOM OFFICE Denver | |
| EASTING 2268071 | BORING COMPLETED 10/2/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 14.0' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

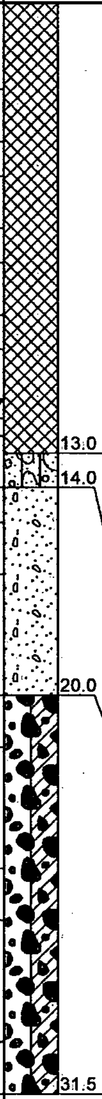
| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-5**<br>**Elevation, Northing and Easting estimated for ED-5** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

DESCRIPTION OF MATERIAL

SURFACE ELEVATION +8,817.3 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE |
|---|---|---|---|
| | | | GB |
| | | 1 | GB |
| | | | GB |
| 5.0 | | 2 | GB |
| | | | GB |
| | | 3 | GB |
| 10.0 | | | GB |
| | | 4 | GB |
| | | | GB |
| | | 5 | GB |
| 15.0 | | | GB |
| | | 6 | GB |
| | | | GB |
| 20.0 | | 7 | GB |
| | | | GB |
| 25.0 | | 8 | GB |
| | | | GB |
| 30.0 | | 9 | GB |
| 31.5 | | | |



FILL - Cobbly Clayey Sandy GRAVEL (GC-GM) - approximately 35% gravel and cobbles, 35% sand and 30% clay and silt fines - fines are moderately plastic - cobbles to 4" - subangular to angular gravel - black 5YR 2.5/1 - medium dense to loose - moist
Color change to dark reddish brown 2.5YR 3/3 from 2.5-5.0'
Void from 4.5-6.0' feet on southwest side of hole
No recovery in core barrel from 5.0-7.5' (hole clean)

Fill appears uncompacted from 8.5-10.0' (voids in matrix)

Color change to black 5YR 2.5/1 from 10.0-12.5'

Becoming wet
Color appears influenced by calcines, no munsell match from 11.5-13.0'

ALLUVIUM - Gravelly Sandy Organic SILT (SM-GM) - up to 40% sand, gravel and cobbles alluvial in nature with some infiltration from above - decomposed roots - organic odor - low plasticity - black - wet
Core sample mixed with upper and lower units in bag.

ALLUVIUM - Silty Sandy Cobbly GRAVEL (GW) - approximately 50% gravel and cobbles up to 4.0", 40% sand and 10% non-plastic silt - predom. subrounded to well rounded gravel but with angular to subangular pieces - reddish black 10R 2.5/1 - dense to loose - wet
Significant increase in angular gravel from 15.0-18.0'
15.0-20.0' - Lost part of the sample - drill went back in to recover - 3 bags in photo, top bag redrill

ALLUVIUM - Clayey Silty Sandy Cobbly GRAVEL (GW-GC) - approximately 60% gravel and cobbles to 4" and well graded, 30% sand and 10% low plasticity silty fines - subrounded to well rounded gravel - loose to medium dense - olive brown 2.5YR 4/4 - wet
20.0-22.0': Highly plastic clay intermixed - up to 20% clay - yellowish brown

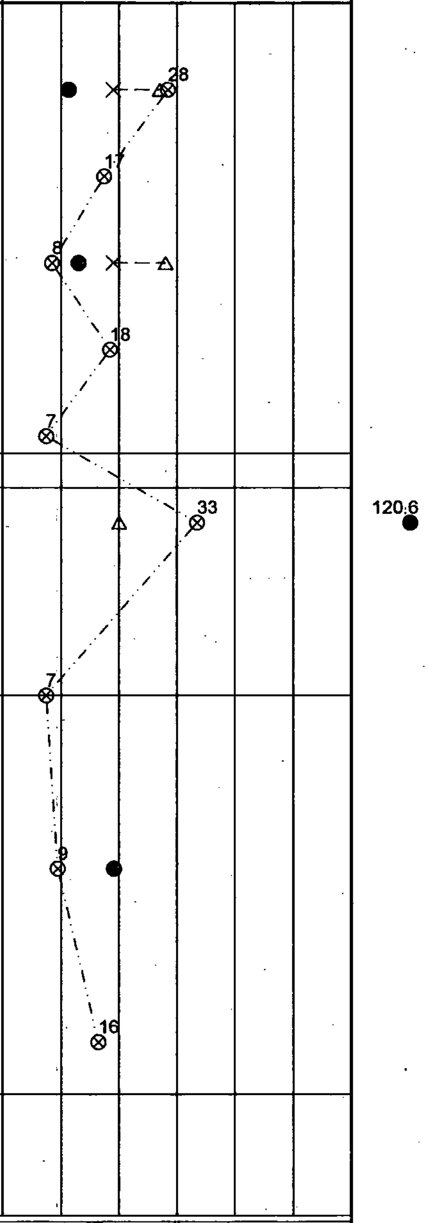
End of Boring
Backfilled with bentonite (13 bags)
Boring logged by: A. Jewell
Casing: 5.5" I.D.

UNIT DRY WT. LBS./FT.$^3$

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$
1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %
× - - - - ● - - - - △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT)
10 20 30 40 50



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388160 | BORING STARTED 10/3/11 | AECOM OFFICE Denver | |
| EASTING 2267688 | BORING COMPLETED 10/3/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 12.0' | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

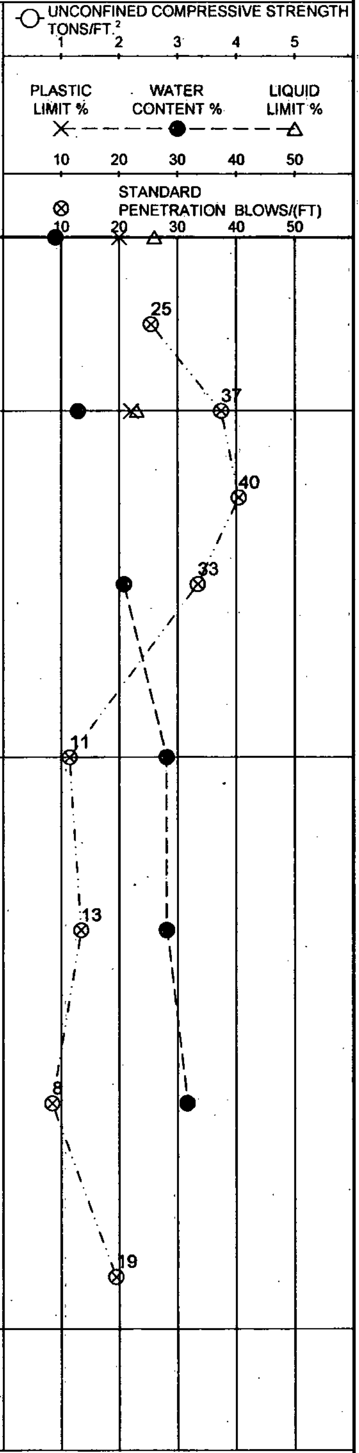
AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **ED-6** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,786.2 Feet

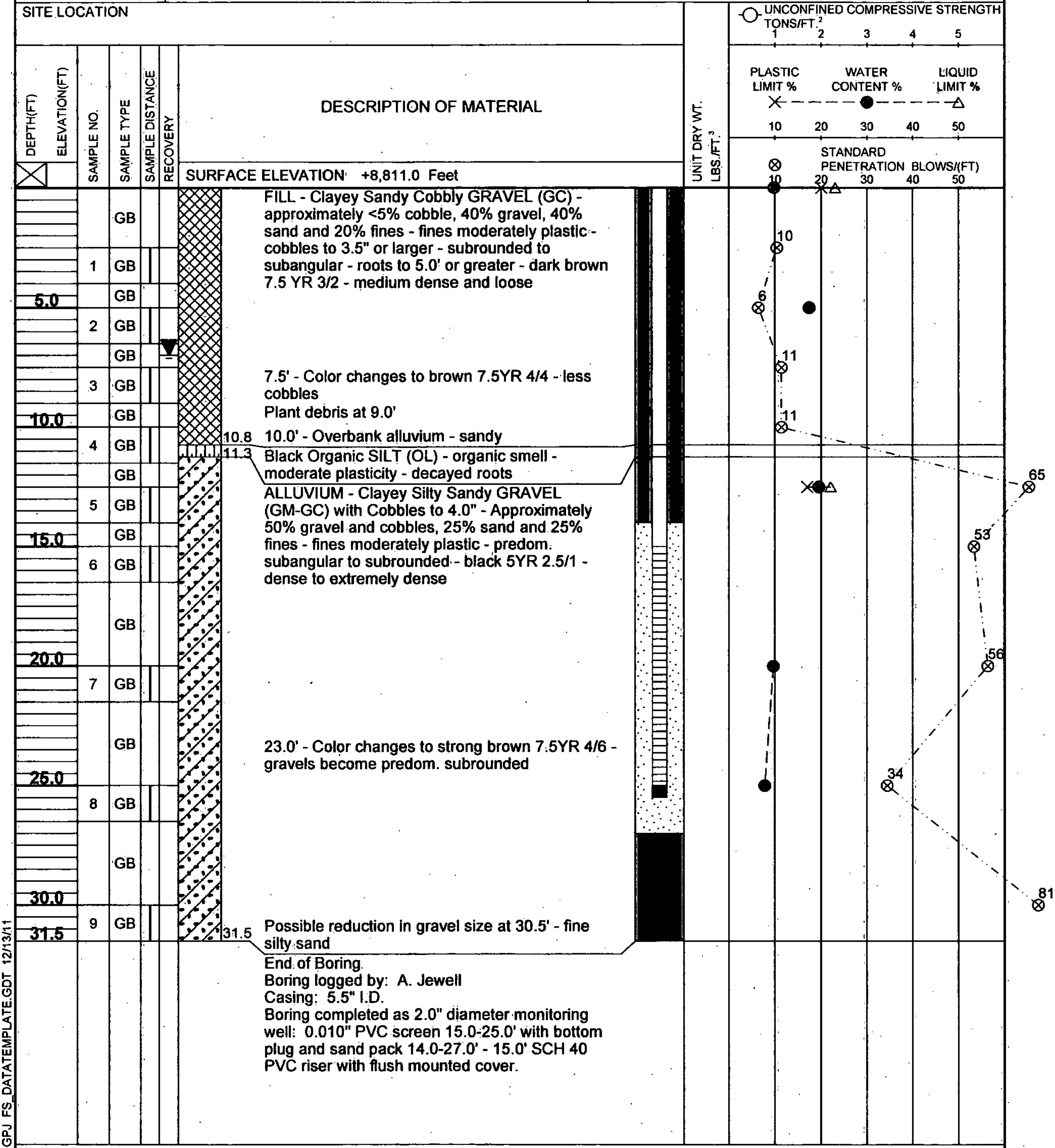
| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | GB | | | FILL - Silty Sandy GRAVEL (GW-GM) - approximately 50% gravel, 35-40% sand and 10-15% silt fines - low plasticity - subangular to angular gravel - reddish brown 2.5YR 4/4 - medium dense to dense - slightly moist | |
| | | 1 | GB | | | | |
| | | | | | | Becomes dark bluish gray | |
| 5.0 | | | GB | | ▼ | 5.0 | |
| | | 2 | GB | | | ALLUVIUM - Clayey Sandy GRAVEL (GC) - approximately 50% gravel, 30% sand and 20% fines - fines clayey with moderate to high plasticity - predom. rounded to subrounded gravel - very dark gray 5YR 3/1 - dense to medium dense - wet<br>7.5-10.0' - Approximately 15% fines. | |
| | | | GB | | | | |
| | | 3 | GB | | | | |
| 10.0 | | | GB | | | | |
| | | 4 | GB | | | | |
| | | | GB | | | | |
| 15.0 | | | | | | 15.0 | |
| | | 5 | GB | | | ALLUVIUM - Silty Gravelly SAND (SM) -subrounded to angular - approximately 40% sand, 40% gravel and 20% fines - reddish brown 2.5YR 5/3 - medium dense and loose - saturated | |
| | | | GB | | | | |
| 20.0 | | | | | | Significant decrease in gravel content - approximately 60% sand, 20% gravel and 20% silt fines - red 2.5YR 5/6 | |
| | | 6 | GB | | | | |
| | | | GB | | | Increase in gravel content - approximately 40% sand, 40% gravel and 20% fines<br>Grades to reddish gray 2.5YR 5/1 - approximately 40% moderately plastic silt fines, 40% sand and 20% gravel | |
| 25.0 | | | | | | | |
| | | 7 | GB | | | | |
| | | | GB | | | Grades to reddish brown 2.5YR 5/4 - approximately 65% sand, 20% gravel and 15% silt fines | |
| 30.0 | | | | | | | |
| 31.5 | | 8 | GB | | | 31.5 | |
| | | | | | | End of Boring<br>Backfilled with bentonite (9 bags)<br>Boring logged by: A. Jewell<br>Casing: 5.5" I.D. | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1386829 | BORING STARTED 10/4/11 | AECOM OFFICE Denver | |
| EASTING 2268171 | BORING COMPLETED 10/4/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 5.0' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-1D** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | | |



DESCRIPTION OF MATERIAL

SURFACE ELEVATION +8,811.0 Feet

FILL - Clayey Sandy Cobbly GRAVEL (GC) - approximately <5% cobble, 40% gravel, 40% sand and 20% fines - fines moderately plastic - cobbles to 3.5" or larger - subrounded to subangular - roots to 5.0' or greater - dark brown 7.5 YR 3/2 - medium dense and loose

7.5' - Color changes to brown 7.5YR 4/4 - less cobbles

Plant debris at 9.0'

10.0' - Overbank alluvium - sandy

Black Organic SILT (OL) - organic smell - moderate plasticity - decayed roots

ALLUVIUM - Clayey Silty Sandy GRAVEL (GM-GC) with Cobbles to 4.0" - Approximately 50% gravel and cobbles, 25% sand and 25% fines - fines moderately plastic - predom. subangular to subrounded - black 5YR 2.5/1 - dense to extremely dense

23.0' - Color changes to strong brown 7.5YR 4/6 - gravels become predom. subrounded

Possible reduction in gravel size at 30.5' - fine silty sand

End of Boring.
Boring logged by: A. Jewell
Casing: 5.5" I.D.
Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 15.0-25.0' with bottom plug and sand pack 14.0-27.0' - 15.0' SCH 40 PVC riser with flush mounted cover.

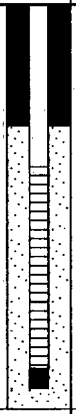
The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387829 | BORING STARTED 9/29/11 | AECOM OFFICE Denver | |
| EASTING 2267941 | BORING COMPLETED 9/30/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 7.0' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

|  |  |  |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-1S** |
|  | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,811.1 Feet | UNIT DRY WT. LBS./FT.$^3$ | ○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5<br>PLASTIC LIMIT % × WATER CONTENT % ● LIQUID LIMIT % △ 10 20 30 40 50<br>⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50 |
|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | No logging - No sampling<br>See MW-1D |  |  |
| 5.0 |  |  |  |  |  |  |  |  |
| 10.0 |  |  |  |  |  | 10.0 |  |  |
|  |  |  |  |  |  | Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 4.0-9.0' with bottom plug and sand pack 3.0-10.0' - 4.0' SCH 40 PVC riser with flush mounted cover. |  |  |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

|  |  |  |  |
|---|---|---|---|
| NORTHING 1387827 | BORING STARTED 9/30/11 | AECOM OFFICE Denver |  |
| EASTING 2267945 | BORING COMPLETED 9/30/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN MINI-SONIC C100/D. Cervantes | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-2D** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,810.4 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY |
|---|---|---|---|---|---|
| | | | GB | | |
| | | 1 | GB | | |
| 5.0 | | | GB | | |
| | | 2 | GB | | |
| | | | GB | | |
| | | 3 | GB | | |
| 10.0 | | | GB | | |
| | | 4 | GB | | ▼ |
| | | | GB | | |
| | | 5 | GB | | |
| 15.0 | | | GB | | |
| | | 6 | GB | | |
| | | | GB | | |
| 20.0 | | | | | |
| | | 7 | GB | | |
| | | | GB | | |
| 25.0 | | | | | |
| 26.5 | | 8 | GB | | |

DESCRIPTION OF MATERIAL

FILL - Embankment - Silty Clayey Sandy GRAVEL (GM) - approximately 45% gravel, 35% sand and 20% fines - scattered cobbles up to 4.0" and larger - predom. subangular to angular gravel - dark reddish brown 5YR 3/2 - medium dense - moist

Color changes to a mix of dark reddish brown 5YR 3/2 to strong brown 7.5YR 4/6 from 1.0-1.5'

1.5-4.5' - Altered waste rock - <10% silt fines - strong brown

Dark reddish brown 7.5YR 5/3 from 4.5-9.0'

Altered waste rock from 9.0-10.0' (similar to 1.5-4.5')

Brown 7.5YR 5/3 from 10.0-11.5'

11.5

ALLUVIUM - Silty Sandy Cobbly GRAVEL (GW) - approximately 5% cobbles, 60% gravel, 25% sand and 10% fines - non-plastic fines - angular to subrounded gravel - dense to medium dense - dark reddish brown 7.5 YR 3/3 - wet

Increasing fines content to approx. 15% and low plasticity from 12.5-15.0' (GM)

Increasing fines content to approx. 25% and low plasticity from 15.0-20.0' (GM)

Color change to reddish brown 5YR 4/4 at 19.0'

20.0

ALLUVIUM - Silty Gravelly SAND (SW) - approximately 50% sand, 45% gravel and 5-10% silt fines - non-plastic fines - well graded - subrounded to angular to predom. well rounded - yellowish red 5YR 5/6 - medium dense - wet

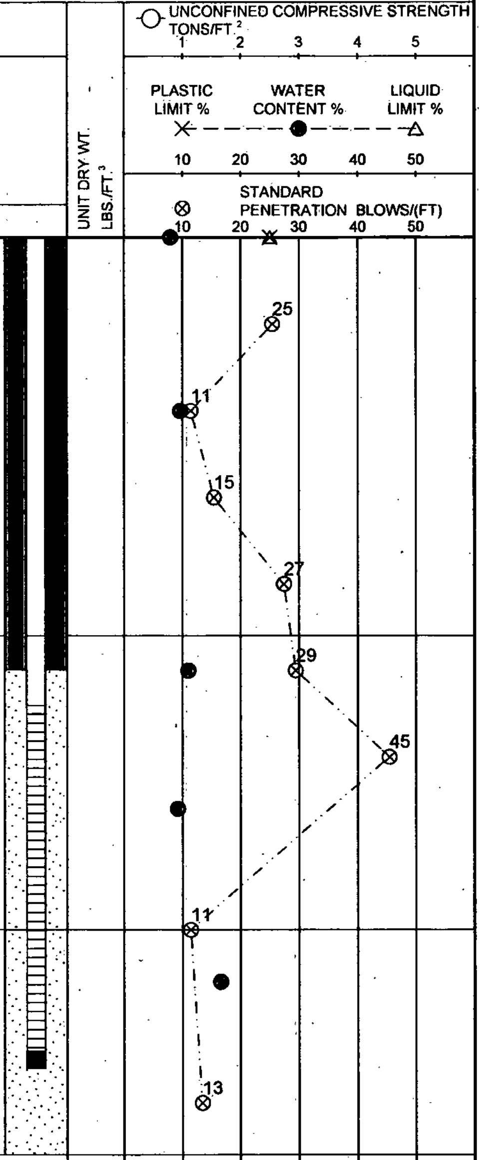
Possible drop in gravel content

26.5

End of Boring

Boring logged by: A. Jewell

Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 13.5-23.5' with bottom plug and sand pack 12.5-26.5' - 13.5' SCH 40 PVC riser with flush mounted cover.



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387836 | BORING STARTED 10/2/11 | AECOM OFFICE Denver | |
| EASTING 2267756 | BORING COMPLETED 10/2/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 11.5' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-2S** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

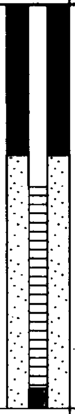
SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,810.5 Feet | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | | | | ▨ No logging - No sampling<br>See MW-2D | |
| 5.0 | | | | | | | |
| 10.0 | | | | | | ▨ 10.0 | |
| | | | | | | Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 5.0-10.0' with bottom plug and sand pack 4.0-10.0' - 5.0' SCH 40 PVC riser with flush mounted cover. | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387830 | BORING STARTED 10/2/11 | AECOM OFFICE Denver | |
| EASTING 2267759 | BORING COMPLETED 10/2/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-3D** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,819.9 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY |
|---|---|---|---|---|---|
| | | | GB | | |
| | | 1 | GB | | |
| 5.0 | | | GB | | |
| | | 2 | GB | | |
| | | | GB | | |
| | | 3 | GB | | |
| 10.0 | | | GB | | |
| | | 4 | GB | | |
| | | | GB | | |
| | | 5 | GB | | |
| 15.0 | | | GB | | |
| | | 6 | GB | | |
| | | | GB | | |
| 20.0 | | 7 | GB | | |
| | | | GB | | |
| 25.0 | | 8 | GB | | |
| 26.5 | | | | | |

DESCRIPTION OF MATERIAL

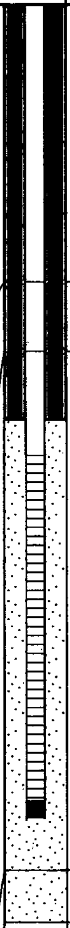
FILL - Silty Cobbly Sandy Clayey GRAVEL (GM-GC) - approximately 5% cobbles, 40% gravel, 35 % sand and 20% fines - cobbles up to 4.5" or larger - predom. angular to subangular gravel - well graded - medium dense - moist
0.0-1.5' - Mostly silt fines - low plasticity - black 5YR 2.5/1
1.5-2.0' - Calcines with above
2.0-2.5' - Fines <10% - low plastic silt (GW)
2.5-6.5' - Predom clay fines - approx. 20% fines, moderate to high plasticity - dark brown 7.5YR 3/3 (GC)
6.5-8.0' - <5% non-plastic silt fines - dark reddish brown 5YR 3/3 (GW)

FILL - Clayey Sandy Cobbly GRAVEL (GC) - approximately 40% gravel, 40% sand and 20% fines - fines clay with moderate to high plasticity - predom. subrounded to well rounded gravel - medium dense - moist to wet
Decayed roots and stems - black color with oxidized rock at 9.5-10.0'

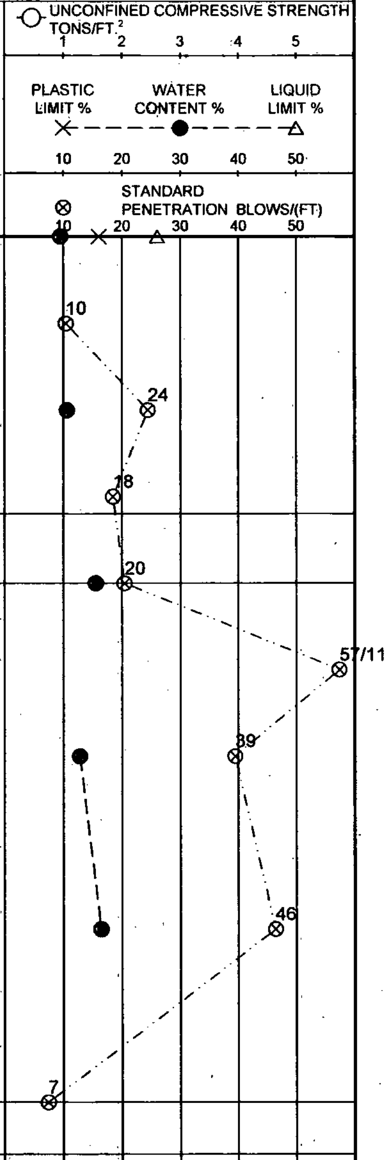
ALLUVIUM - Silty Clayey Cobbly GRAVEL (GC) - approximately 50% gravel and cobbles, 35% sand and 15% clay and silt fines - moderately plastic fines - predom. subrounded to rounded - black 5YR 2.5/1 - dense to loose - moist to wet
11.5-12.5' - Grades to dark brown 7.5YR 3/3 - fines become predom. silt - low plasticity - <10% (GW)
12.5-15.0' - reduction in cobble content and gravel to 40% in favor of sand (SW)
15.0-16.0' - No cobbles - <5% silt fines - approx. 60% gravel and 40% sand (GW)
16.0-17.5' - Increases fines - approx. 15% high plasticity clay - yellowish brown 10YR 5/8 (GW-GC)
17.5-20.0' - Transitions to siltier fines - low plasticity - approx 15% fines content - grades to dark brown 7.5YR 3/3 (GW-GC)
20.0-22.5' - Transitions back to strong brown color 7.5YR 4/4
22.5-25.0' - Transitions to <5% fines - reduction in gravel to approx. 50% gravel and 45% sand (GW)

Silty SAND (SM-SP) - predom. medium grained - subangular to subrounded with scattered well rounded gravels - strong brown 7.5YR 4/6

End of Boring
Boring logged by: A. Jewell
Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 13.0-23.0' with bottom plug and sand pack 12.0-25.5' - 13.0' SCH 40PVC riser with flush mounted cover.



UNIT DRY WT. LBS./FT.$^3$



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

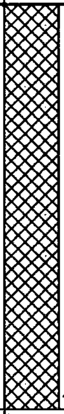
| | | | |
|---|---|---|---|
| NORTHING 1388313 | BORING STARTED 10/3/11 | AECOM OFFICE Denver | |
| EASTING 2267602 | BORING COMPLETED 10/3/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 12.0' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

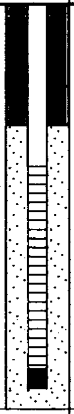
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-3S** |
|---|---|---|
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ | PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ (10 20 30 40 50); ⊗ STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | SURFACE ELEVATION +8,819.9 Feet | | |
| | | | | | | No logging - No sampling<br><br>See MW-3D | | |
| 5.0 | | | | | | | | |
| 10.0 | | | | | | 10.0 | | |
| | | | | | | Boring completed as 2.0" diameter monitoring well: Total depth 10.0' - 0.010" PVC screen 4.0-9.0' with bottom plug and sand pack 3.0-10.0' - 4.0' SCH 40 PVC riser with flush mounted cover. | | |





The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388563 | BORING STARTED 10/3/11 | AECOM OFFICE Denver | |
| EASTING 2267604 | BORING COMPLETED 10/3/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

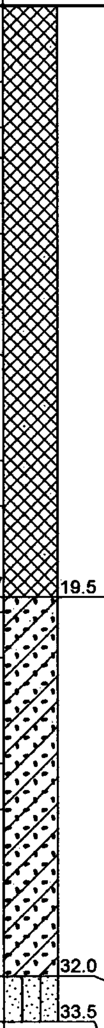
| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-4D/4DR** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY |
|---|---|---|---|---|---|
| | | | GB | | |
| | | 1 | GB | | |
| 5.0 | | | GB | | |
| | | 2 | GB | | |
| | | | GB | | |
| | | 3 | GB | | |
| 10.0 | | | GB | | |
| | | 4 | GB | | |
| | | | GB | | |
| 15.0 | | 5 | GB | | |
| | | | GB | | |
| 20.0 | | 6 | GB | | |
| | | | GB | | |
| 25.0 | | 7 | GB | | |
| | | | GB | | |
| 30.0 | | | GB | | |
| 33.5 | | 8 | GB | | |

DESCRIPTION OF MATERIAL

SURFACE ELEVATION +8,816.6 Feet



FILL - Clayey Cobbly Sandy GRAVEL (GC) - approximately 50% gravel and cobbles, 30% sand and 20% clayey fines - moderately plastic - predom. subangular to angular gravel - dark reddish brown 5YR 3/3 - dense to loose - moist

Becoming very cobbly (GW-GC) - cobbles up to 6.0" - up to 30% cobble content - Becoming slightly moist - color change to dark reddish gray 2.5YR 3/1

Possible fill/colluvium contact at 11.0' - clayey cobbly sandy gravel (GC) - approximately 50% gravel, 30% sand and 20% moderate plasticity clay fines - cobbles to 6.0" or larger - predom. subangular to angular gravel - reddish brown 7.5YR 3/4 - moist

Large greenstone boulder in hole from 12.0-16.0'

Transitions to yellowish red 7.5YR 4/6 from 12.5-15.0'

15.0-20.0' - Poor recovery - possible voids

Offset boring 10.0' southwest - renamed MW-4DR

ALLUVIUM - Cobbly Clayey Silty Sandy GRAVEL (GM-GC) - approximately 25% cobbles, 30% gravel, 30% sand and 15% clay/silt fines - cobbles up to 6.0" - predom. rounded to subrounded - brown 7.5YR 4/4 - dense to extremely dense - wet

24.0-25.0' - <5% fines, 30% sand, 60% gravel and slight organic content - black (GW)

25.0-30.0' - Core sample mixed - becomes red below approximately 27.0' - includes predom. angular to subangular gravels - predom. silt fines (GW)

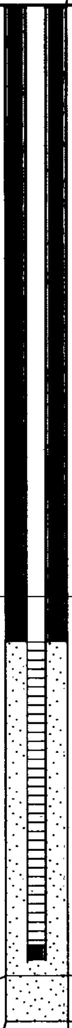
Transitions to predom. subrounded to rounded gravel with clay fines up to 15% from 30.0-32.0' (GW-GC)

ALLUVIUM - fine to medium Silty SAND (SM) with scattered coarse grained Sand and Gravel up to 1.0" - subangular to subrounded - yellowish red 5YR 5/8

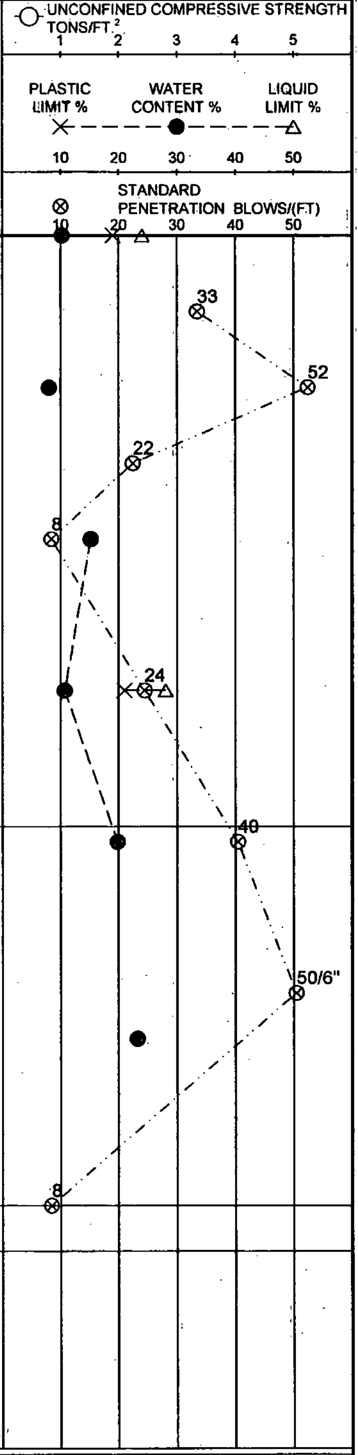
End of Boring

Boring logged by: A. Jewell

Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 21.0-31.0' with bottom plug and sand pack 21.0-32.0' - 21.0' SCH 40 PVC riser with flush mounted cover.



UNIT DRY WT. LBS./FT.$^3$



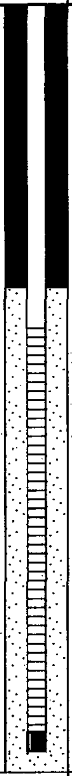
The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387837 | BORING STARTED 10/5/11 | AECOM OFFICE Denver | |
| EASTING 2268222 | BORING COMPLETED 10/5/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 19.5' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-4S** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ | ○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5 <br> PLASTIC LIMIT % ✕ – WATER CONTENT % ● – LIQUID LIMIT % △ 10 20 30 40 50 <br> ⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | SURFACE ELEVATION +8,817.1 Feet | | |
| | | | | | | *No logging - No sampling*<br>See MW-4D | | |
| 5.0 | | | | | | | | |
| 10.0 | | | | | | | | |
| 15.0 | | | | | | | | |
| 19.0 | | | | | | 19.0 | | |



Boring completed as 2.0" diameter monitoring well: Total depth 19.0' - 0.010" PVC screen 8.0-18.0' with bottom plug and sand pack 8.0-19.0' - 8.0' SCH 40 PVC riser with flush mounted cover.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1387839 | BORING STARTED 10/5/11 | AECOM OFFICE Denver | |
| EASTING 2268225 | BORING COMPLETED 10/5/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

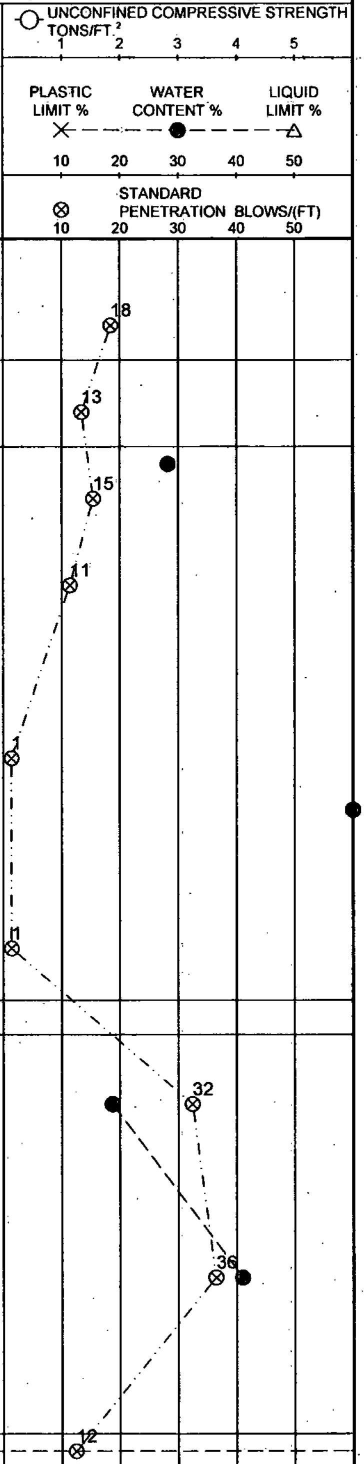
| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-5D** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,831.1 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL |
|---|---|---|---|
| | | GB | PDF EMBANKMENT FILL - Silty Sandy GRAVEL (GW) - subangular to subrounded - medium dense - brown 7.5 YR 4/4 - moist |
| 3.5 | 1 | GB | |
| | | GB | FILL - Oxidized material - Clayey SAND (SC) - low plasticity fines - dark reddish brown 2.5YR 2.5/3 - loose - moist |
| 5.0 | | | |
| 6.0 | 2 | GB | |
| | | GB | FILL - Calcines - Silty fine SAND (SP) and silt sized - estimated <10% fines - reddish purple (no munsell) - medium dense to very loose - moist |
| | 3 | GB | |
| 10.0 | | GB | |
| | 4 | GB | |
| | | GB | |
| 15.0 | 5 | GB | Becoming wet and black/reddish purple below 15.0' |
| | | GB | Becomes silty with low plasticity fines at 17.0' - estimated up to 30% silt |
| 20.0 | | | |
| 22.0 | 6 | GB | |
| 23.0 | | | Organic SILT (ML-OL) - probable overbank deposits - decayed plant fibers - trace fine sand and thin 1/8" calcine layers - low plasticity - greenish black - moist to wet |
| | | GB | ALLUVIUM - Silty Sandy Cobbly GRAVEL (GM) - color varies - dense - saturated |
| 25.0 | 7 | GB | Clayey sandy cobbly gravel (GC) - fines moderately plastic - very dark gray 7.5YR 3/1 - predom. subangular with some subrounded |
| | | GB | Transition to silt fines (GW-GM) - reddish brown 5YR 4/4<br>Very dark gray 7.5YR 3/1 - becomes predom. subrounded |
| 30.0 | 8 | GB | Lower fines content (<10%) (GW) - dark yellowish brown 10YR 4/6 |
| | | GB | Increased fines, approximately 15% (GW-GM) - yellowish brown 10YR 5/8 - medium dense |
| 34.5 | | | |
| 35.0 | | | |

. . . continued



UNIT DRY WT. LBS./FT.³

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 1 OF 2

| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-5D** |
|---|---|---|
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT) ⊗ 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,831.1 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| 36.5 | | 9 | GB | | | 36.5 ALLUVIUM - Gravelly Silty SAND (SM) - approximately 10% gravel, 15% silt and 75% sand - red 2.5YR 5/6 - wet - medium dense | |

End of Boring
Boring logged by: A. Jewell
Casing: 5.5" I.D.
Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 11.0-21.0' with bottom plug and sand pack 10.0-21.0' - 11.0' SCH 40PVC riser with flush mounted cover.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388375 | BORING STARTED 10/9/11 | AECOM OFFICE Denver | |
| EASTING 2267814 | BORING COMPLETED 10/9/11 | ENTERED BY SJH | SHEET NO. 2 OF 2 |
| WL 15.5' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-5S** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

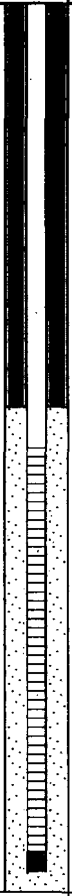
SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ – – – WATER CONTENT % ● – – – LIQUID LIMIT % △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,831.1 Feet | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | | | | No logging - No sampling<br>See MW-5D | |
| 5.0 | | | | | | | |
| 10.0 | | | | | | | |
| 15.0 | | | | | | | |
| 20.0 | | | | | | | |
| 22.0 | | | | | | 22.0 | |
| | | | | | | Boring completed as 2.0" diameter monitoring well: Total depth 22.0' - 0.010" PVC screen 11.0-21.0' with bottom plug and sand pack 10.0-22.0' - 11.0' SCH 40 PVC riser with flush mounted cover. | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388370 | BORING STARTED 10/9/11 | AECOM OFFICE Denver | |
| EASTING 2267814 | BORING COMPLETED 10/10/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-6D** |
|---|---|---|
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

DESCRIPTION OF MATERIAL

SURFACE ELEVATION +8,830.6 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE |
|---|---|---|
| | | GB |
| | 1 | GB |
| 5.0 | | GB |
| | 2 | GB |
| | | GB |
| | 3 | GB |
| 10.0 | | GB |
| | 4 | GB |
| | | GB |
| | 5 | GB |
| 15.0 | | GB |
| | 6 | GB |
| | | GB |
| | 7 | GB |
| 20.0 | | GB |
| | 8 | GB |
| | | GB |
| 25.0 | 9 | GB |
| | | GB |
| 30.0 | | |

FILL - Dike - altered wasterock, Silty Cobbly Sandy GRAVEL (GW-GM) - approximately 45% gravel and cobbles, 40% sand and 15% silt - cobble to 4.0" or larger - predom subangular - strong brown 7.5YR 5/6 - medium dense - slightly moist

3.5

0.0-0.66' - Highly altered wasterock - rock matrix evident - clays residual include greenish gray, yellow 5YR 8/6 and white

FILL - Dike - Clayey Cobbly Sandy GRAVEL (GC) - approximately 40% gravel and cobbles, 40% sand and 20% clay fines - cobbles to 4.0" or larger - predom. subangular to angular - dark brown 7.5YR 3/3 - dense to medium dense - moist - highly plastic clay fines - various colors, dark reddish brown 2.5YR 3/4 and dark brown 10YR 2/2

Cobbly layer - cobbles to 5.0" or larger, subround to subangular at 9.5-10.0'

Cobbly layer - cobbles to 3.0" or larger, subangular at 13.0-13.5' - extremely dense

Possible colluvium from 13.0-17.0'

13.5' - Changes to silt fines - approximately 15% fines - brown 7.5YR 4/2 - very cobbly (GW-GM)

15.0' - Becomes dark reddish brown 2.5YR 3/4 - gap graded - approximately 5% fines, 5% sand and rest gravel and cobbles - cobbles to 5.0" or larger (GP)

Significant increase in clay fines to 20% and tree stems to 3/8" relatively undecayed from 16.5-17.5' (GC)

17.5

ALLUVIUM - Organic SILT (ML-OL) - decayed plant matter - scattered gravel to 1.0" or larger - medium dense - moist

18.0' - Significant increase in gravels - subangular to angular - up to 30% gravels - gap graded - decayed plant matter

20.0

COLLUVIUM - Silty Sandy GRAVEL (GM) to 2.0" or larger - predom. angular to subangular - very dark gray 7.5YR 3/1 - extremely dense - slightly moist

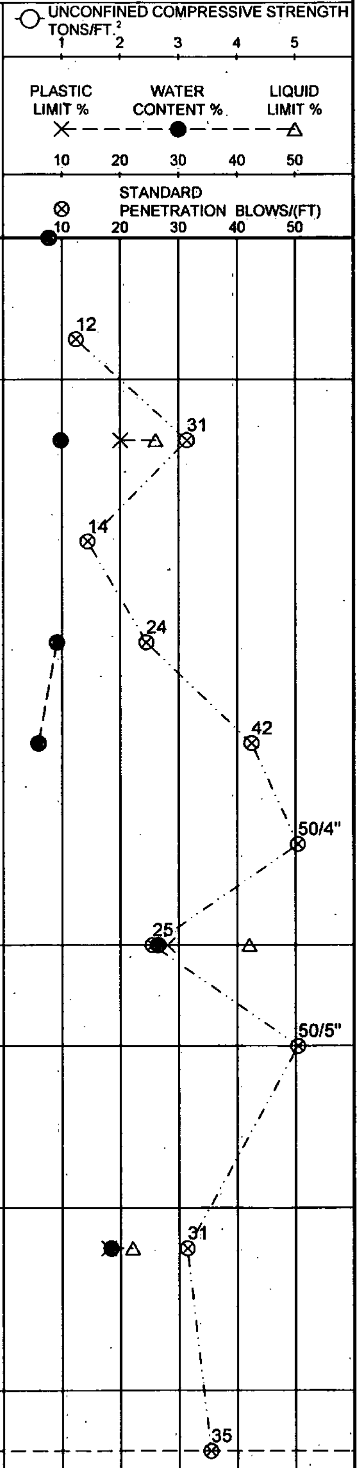
24.0

ALLUVIUM - Clayey Gravelly Cobbly SAND (SC) - approximately 40% sand, 30% cobbles and gravel and 30% moderately plastic clay - cobbles to 6.0" or larger - predom. subangular to angular - dark gray 7.5YR 4/1 - dense - wet

28.5

. . . continued

UNIT DRY WT. LBS./FT.$^3$



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

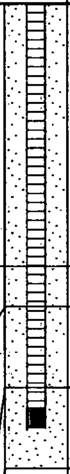
AECOM JOB NO. 60157757

SHEET NO. 1 OF 2

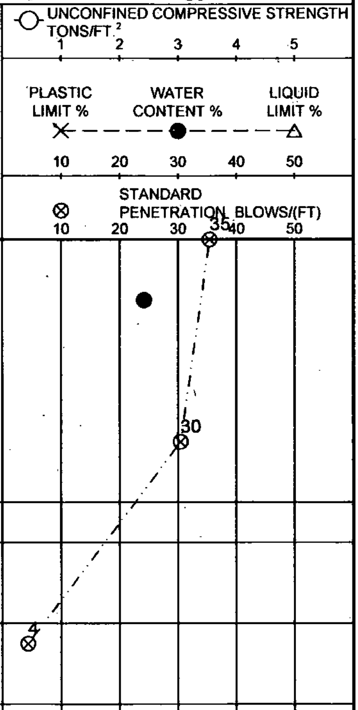
| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-6D** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,830.6 Feet (Continued) | UNIT DRY WT. LBS./FT.³ |
|---|---|---|---|---|---|---|---|
| | | 10 | GB | | | ALLUVIUM - Clayey Gravelly Cobbly SAND (SC) - approximately 40% sand, 30% cobbles and gravel and 30% moderately plastic clay - cobbles to 6.0" or larger - predom. subrounded to angular - dark gray 7.5YR 4/1 - dense - wet<br>31.5' - Becomes Silty Sandy GRAVEL (GW) - approx. 60% gravel, 30% sand and 10% fines - predom. subrounded to subangular - dark brown<br>Becomes strong brown 7.5YR 4/6 at 34.0' | |
| | | | GB | | | | |
| 35.0 | | 11 | GB | | | 36.5 | |
| | | | | | | ALLUVIUM - Silty fine SAND (SP) - <5% silt - medium grain sand - dark yellowish brown 10YR 4/4 - wet<br>37.5 | |
| | | | GB | | | ALLUVIUM - Sandy GRAVEL (GW) - subangular to subrounded - approximately 60% gravel, 40% sand and <3% silt - gravel to 3.0" - well graded - subangular to subrounded - wet<br>39.5<br>Core sample from 37.5-40.0' is probably loosened, mixed and sorted due to multiple attempts to clean hole (flapper bit) | |
| 40.0 | | 12 | GB | | | ALLUVIUM - Silty fine SAND (SM) - up to 20% silt - low plastic fines - strong brown 2.5YR 3/4 - loose<br>Becomes dark reddish brown 12.5YR 3/4 at 41.0' | |
| 41.5 | | | | | | 41.5 | |



End of Boring
Boring logged by: A. Jewell
Casing: 5.5" I.D.
Boring completed as 2.0" diameter monitoring well: 0.010" PVC screen 30.0-40.0' with bottom plug and sand pack 29.0-41.5' - 30.0' SCH 40PVC riser with flush mounted cover.



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388166 | BORING STARTED 10/11/11 | AECOM OFFICE Denver | |
| EASTING 2268148 | BORING COMPLETED 10/11/11 | ENTERED BY SJH | SHEET NO. 2 OF 2 |
| WL 23.75' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **MW-6S** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

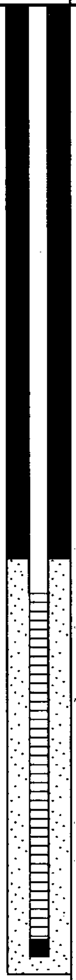
SITE LOCATION

-○- UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$
1 2 3 4 5

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | | | | SURFACE ELEVATION +8,830.7 Feet | |
| | | | | | | No logging - No sampling<br>See MW-6D | |
| 5.0 | | | | | | | |
| 10.0 | | | | | | | |
| 15.0 | | | | | | | |
| 20.0 | | | | | | | |
| 25.0 | | | | | | | |
| 28.0 | | | | | | | |

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT)
10 20 30 40 50



Boring completed as 2.0" diameter monitoring well: Total depth 28.0' - 0.010" PVC screen 17.0-27.0' with bottom plug and sand pack 16.0-28.0' - 17.0' SCH 40 PVC riser with flush mounted cover.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388166 | BORING STARTED 10/11/11 | AECOM OFFICE Denver | |
| EASTING 2268153 | BORING COMPLETED 10/11/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR1** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

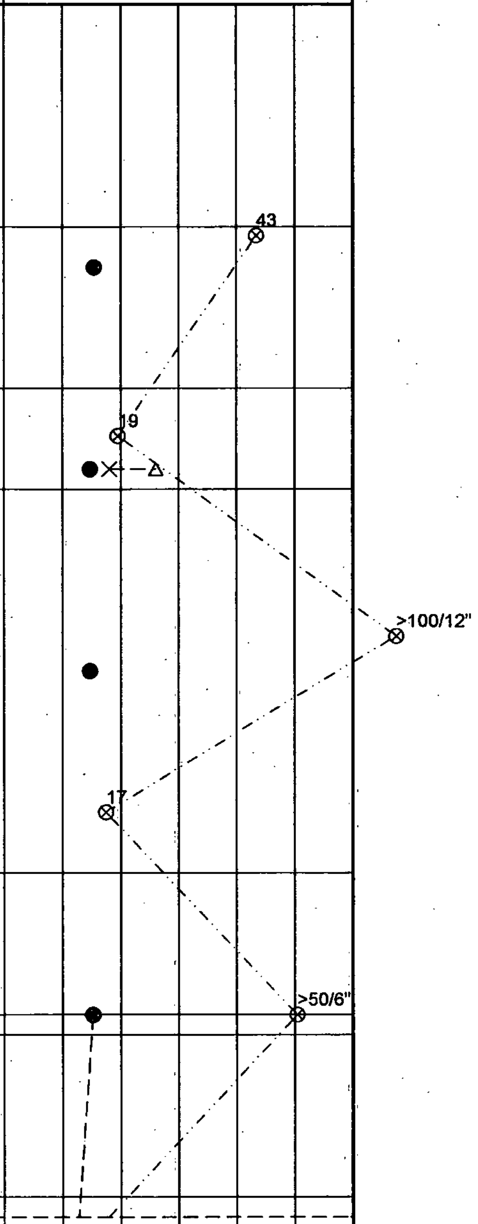
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

UNIT DRY WT. LBS./FT.$^3$

SURFACE ELEVATION +8,861.5 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|---|---|
| | | 1 | SS | | | FILL - Silty GRAVEL (GM) - angular rock fragments to 5" minus - moist - brown (waste rock) |
| | | | PA | | | |
| 5.0 | | | | | | 5.5 |
| | | 2 | SS | | | Clayey SILT with trace coarse to fine Sand and Gravel 3" minus (ML) - dense - moist - brown |
| | | | PA | | | 9.5 |
| 10.0 | | | | | | Silty GRAVEL (GM) - subrounded 3" minus - dry - medium dense - gray |
| | | 3 | SS | | | 12.0 Same with increasing clay |
| | | | PA | | | Silty CLAY (CL) - with trace angular gravel fragments to 1" minus and cobbles 4" minus - extremely dense to medium dense - moist |
| 15.0 | | 4 | SS | | | >50 blows 6-12" at 15.5' (cobble in CL) |
| | | | PA | | | Decrease angular and subrounded gravel cobble size |
| 20.0 | | 5 | SS | | | Increase in angular gravel fragments<br>21.5 |
| | | | PA | | | Very Silty GRAVEL (GM) - angular and subrounded up to 2-3" minus - moist - brown<br>25.0 |
| 25.0 | | 6 | SS | | | 25.5 Silty CLAY, trace pebble Gravel and Sand (CL) - extremely dense - moist - brown<br>>50 blows 0-6" at 25.0' (cobbles) |
| | | | PA | | | Very Silty GRAVEL (GM) - angular - cobbles 4" minus - moist - brown<br>29.5 |
| 30.0 | | | | | | |



. . . continued

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757 SHEET NO. 1 OF 3

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

**AECOM**

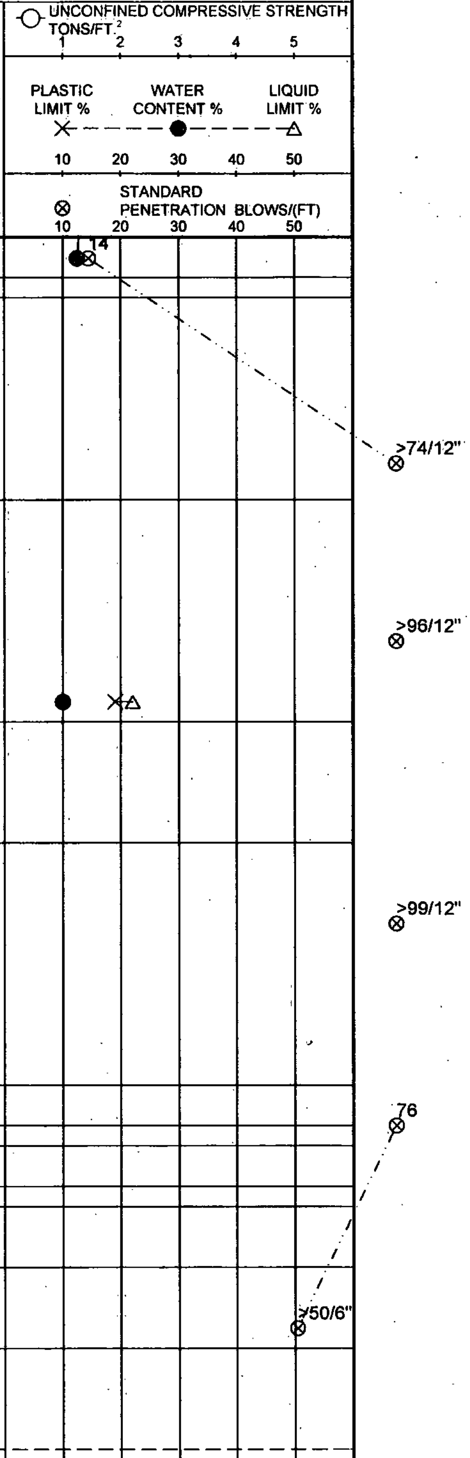
| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR1** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,861.5 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | Strata depth | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| | 7 | SS | 31.0 | Clayey GRAVEL (GC) - angular to subrounded cobbles 6" minus - medium dense - moist - brown |
| | | | 31.5 | 0.5' section of Sandy CLAY (SC) |
| 35.0 | | PA | | Silty GRAVEL (GM) - mostly angular 2" minus - very dense - moist - wet at 34.0' |
| | 8 | SS | 36.5 | Loose and flowing at 36.0-37.0' |
| 40.0 | | PA | | Well graded GRAVEL, trace Silt (GW) - mostly subangular 2" minus - extremely dense - wet - dark brown<br>Increasing silt |
| | 9 | SS | 42.0 | Less gravel, more silt, with trace clay - subrounded 3" minus |
| 45.0 | | PA | 45.0 | Clayey GRAVEL (GC) - subrounded cobbles 5" minus - wet but much less water |
| | | | | 45.0' - Changing sampling interval so that casing can be at TD of hole rather than 2 feet above TD |
| | 10 | SS | | Well graded GRAVEL with Silt (GW) - subrounded cobbles up to 6" minus - striated cobbles - extremely dense - wet |
| 50.0 | | PA | 51.0 | |
| | | | 52.0 | Poorly sorted SAND (SP), fine grained Sand - wet |
| | 11 | SS | 52.5 | Well graded SAND (SW), fine to coarse size - very dense - wet |
| | | | 53.5 | Well graded GRAVEL (GW) - up to 1" minus - wet |
| | | | 54.0 | Clayey GRAVEL (GC) - 1" minus gravel - wet - well rounded |
| 55.0 | | PA | 55.5 | Gravelly CLAY (GC) - wet - below boulder |
| | | | 57.5 | Clayey GRAVEL (GC) - angular and subrounded cobbles - extremely dense - wet |
| | 12 | SS | | Silty GRAVEL (GM) - mostly angular and subangular 3-4" minus - moist |
| 60.0 | | | | |

. . . continued



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 2 OF 3

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR1** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,861.5 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ | UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5<br>PLASTIC LIMIT % ✕ – – WATER CONTENT % ● – – LIQUID LIMIT % △<br>10 20 30 40 50<br>⊗ STANDARD PENETRATION BLOWS/(FT)<br>10 20 30 40 50 |
|---|---|---|---|---|---|---|---|---|
| | | | PA | | | 60.5 | | |
| | | | | | | Poorly sorted SAND (SP) - fine grained | | |
| | | | | | | 61.5 | | |
| 62.0 | | | | | | 62.0 Well sorted GRAVEL (GW) | | |
| | | | | | | End of Boring<br>Boring logged by: L. Beem<br>Casing: 7.0" I.D. | | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1389436 | BORING STARTED 10/3/11 | AECOM OFFICE Denver | |
| EASTING 2268299 | BORING COMPLETED 10/4/11 | ENTERED BY SJH | SHEET NO. 3 OF 3 |
| WL 34.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

|  |  |  |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR2** |
|  | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

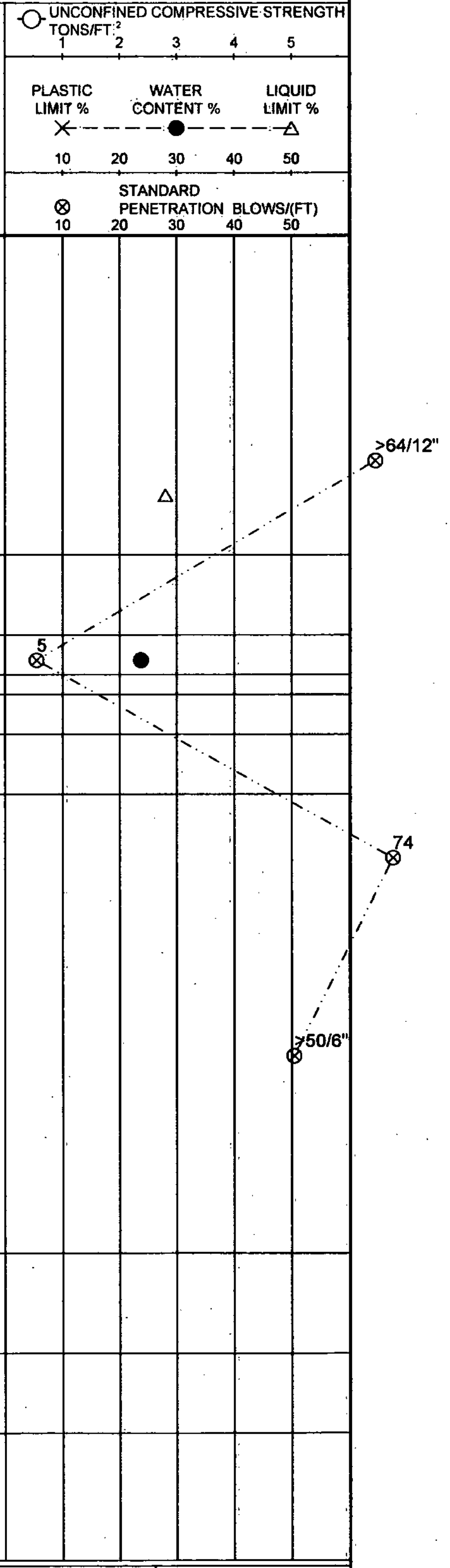
SITE LOCATION

SURFACE ELEVATION +8,845.8 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL |
|---|---|---|---|
|  | 1 | SS | FILL - Silty GRAVEL (GM) - extremely dense - moist - grayish - angular - reworked laydown yard gravel and mine waste rock |
|  |  | PA |  |
| 5.0 | 2 | SS |  |
|  |  | PA | Boulders |
|  |  |  | 8.0 |
|  |  |  | Clayey SILT with trace coarse sand size rock fragments (ML) - moist - brown |
| 10.0 |  |  | 10.0 |
|  | 3 | SS | Silty CLAY with trace pebble Gravel (CL) - moist - brown |
|  |  |  | 11.0 |
|  |  |  | Poorly sorted fine to medium SAND (SP) - moist |
|  |  |  | 11.5 |
|  |  |  | Silty SAND with trace pebble Gravel (SM) |
|  |  | PA | 12.5 |
|  |  |  | Silty CLAY (CL) - moist - brown |
|  |  |  | 14.0 |
| 15.0 |  |  | Silty GRAVEL (GM) - angular to subrounded cobbles up to 7" - very dense to extremely dense - dry - gray-brown |
|  | 4 | SS | >50 blows 6-12" at 15.5' |
|  |  | PA |  |
| 20.0 | 5 | SS | >50 blows 0-6" at 20.0' |
|  |  |  | Increasing silt - wet at 21.0' |
|  |  | PA | Increasing clay - wet |
| 25.0 |  |  | No SPT at 25.0' - boulders/cobbles |
|  |  |  | 25.5 |
|  | 6 | SS | Well sorted GRAVEL, up to 2" diameter, with Silt (GW) - red-brown |
|  |  |  | 28.0 |
|  |  | PA | Clayey GRAVEL (GC) - cobbles increase to 5-6" diameter - wet - red-brown<br>Clay at 29.0-30.0' |
| 30.0 |  |  | 30.0 |

. . . continued

UNIT DRY WT. LBS./FT.$^3$



| The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual. | AECOM JOB NO. 60157757 | SHEET NO. 1 OF 4 |
|---|---|---|

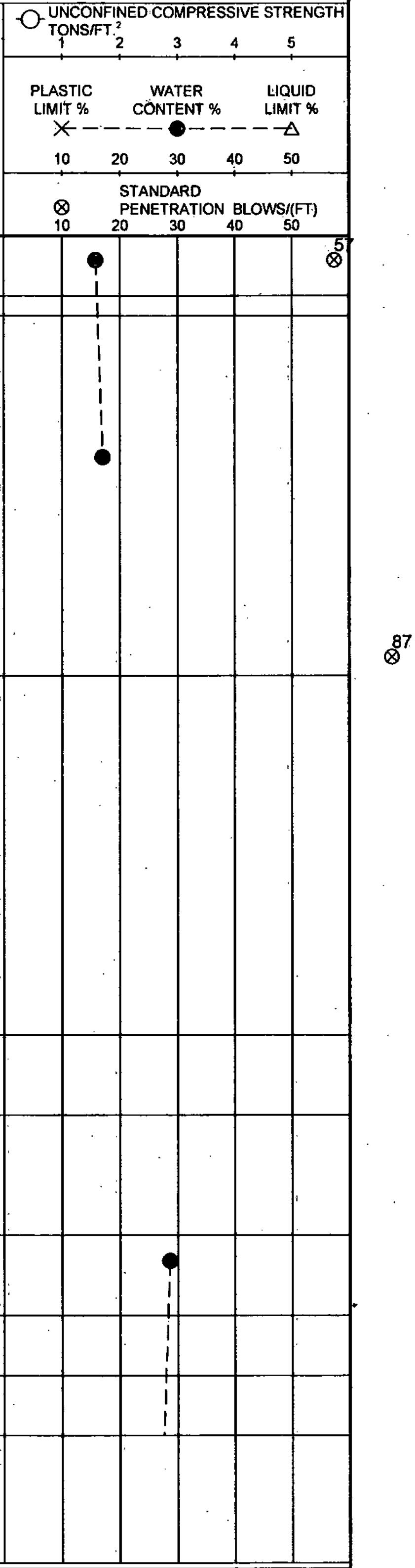
| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,845.8 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | STRATUM DEPTH | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.³ |
|---|---|---|---|---|---|---|---|---|
| | | 7 | SS | | | | *NOTE: Yellow stain zone near 30.0'. Same as gravels stained from mine tunnel water. | |
| | | | | | | 31.5 | Silty GRAVEL (GM), slight flow of fines - very dense - wet to saturated - gray | |
| | | | | | | 32.0 | Clayey GRAVEL (GC), core intact with smaller angular gravel 1.5" minus - wet - gray | |
| | | | PA | | | | Silty GRAVEL (GM), slight flow of fines - extremely dense - wet to saturated - gray | |
| 35.0 | | 8 | SS | | | | | |
| | | | | | | | 36.0' - Color changes to red-brown | |
| | | | PA | | | | Increasing clay - cobbles up to 6" in diameter - angular - red-brown<br>2" minus gravel - core intact | |
| 40.0 | | 9 | SS | | | 41.0 | | |
| | | | PA | | | | Well sorted GRAVEL (GW), mostly subrounded cobbles up to 5" in diameter - wet - saturated - red-brown | |
| 45.0 | | 10 | SS | | | | No SPT at 45.0' flowing gravels | |
| | | | PA | | | | Most of core was water - gravel, cobbles up to 4-5" in diameter<br>No SPT - flowing sands into hole | |
| 50.0 | | | | | | 50.0 | | |
| | | 11 | SS | | | | Poorly sorted SAND with trace pebble size Gravel (SP) - wet - brown | |
| | | | | | | 52.0 | | |
| | | | PA | | | | Well sorted GRAVEL, pebble size Gravel, increasing coarse Sand size with depth (GW) - wet - brown | |
| 55.0 | | | | | | 55.0 | No SPT at 55.0' - flowing sands | |
| | | 12 | SS | | | | Poorly sorted SAND (SP), fine grained sand - wet saturated | |
| | | | | | | 57.0 | | |
| | | | PA | | | | Well sorted SAND, with trace pebble size Gravel, fine to coarse Sand (SW) - wet | |
| | | | | | | 58.5 | | |
| | | | | | | | Silty GRAVEL, with trace Clay near 60.0', subrounded up to 2" in diameter (GM) - wet - brown | |
| 60.0 | | | | | | 60.0 | | |

. . . continued



| | | |
|---|---|---|
| The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual. | AECOM JOB NO. 60157757 | SHEET NO. 2 OF 4 |

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR2** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | |

SURFACE ELEVATION +8,845.8 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL | STANDARD PENETRATION BLOWS/(FT) |
|---|---|---|---|---|
| | 13 | SS | Poorly sorted SAND (SP), fine grained Sand - medium dense - wet - brown - saturated<br>62.0 | 20 |
| | | PA | Well sorted SAND with trace pebble size Gravel, fine to coarse Sand (SW) - wet - brown - *fine grains and deposits below 4" cobble*<br>63.0 | |
| | | | Silty GRAVEL (GM), pebble-cobble up to 4" minus - wet - brown<br>65.0 | |
| 65.0 | 14 | SS | Poorly sorted SAND (SP), fine grained Sand - saturated - red-brown<br>66.0 | |
| | | PA | Silty GRAVEL, cobble up to 7" diameter (GM) - wet - brown<br>67.5 | |
| | 15 | SS | Well graded SAND, fine to coarse grained Sand (SW) - fining upwards - wet - red-brown<br>69.5 | |
| 70.0 | | PA | Well graded GRAVEL (GW) - wet - red-brown<br>Color changes to gray-brown at 71.0'<br>71.5 | |
| | 16 | SS | Poorly sorted SAND (SP), fine to medium grade - very dense - saturated - gray<br>73.0 | 73 |
| | | | Well graded SAND, trace pebble Gravel 2" minus (SW) - fining upwards - wet - red-brown<br>74.5 | |
| 75.0 | | PA | Silty GRAVEL (GM) - angular subrounded cobbles 4" minus with 2" gravel interbedded at 76.0' - wet - red-brown<br>>60 blows 12-18" at 76.0'<br>77.0 | |
| | 17 | SS | Poorly sorted SAND (SP) - fining upwards - extremely dense - saturated - red-brown<br>Fine to medium sand<br>79.5 | 118 |
| 80.0 | | PA | Well graded GRAVEL, mostly subrounded 3" minus (GW) - wet - red-brown<br>82.0 | |
| | 18 | SS | Poorly graded SAND (SP), medium to fine grained - fining upwards - dense - saturated - red-brown<br>83.0 | 48 |
| 85.0 | | PA | Well graded GRAVEL (GW), subrounded 2" minus - extremely dense - wet - red-brown to gray | |
| | 19 | SS | No recovery from 87.0-95.0'<br>>50 blows 6-12" at 87.5' | >90/12" |
| 90.0 | | | | |

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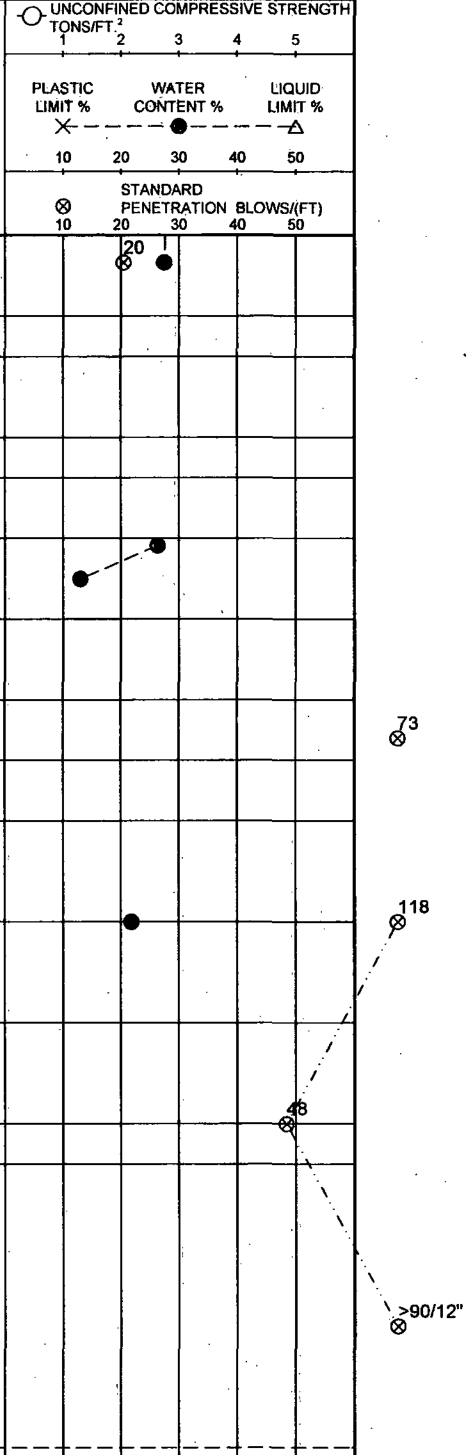

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | |
|---|---|---|
| | AECOM JOB NO. 60157757 | SHEET NO. 3 OF 4 |

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,845.8 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | PA | | | Well graded GRAVEL (GW), subrounded 2" minus - extremely dense - wet - red-brown to gray | |
| | | 20 | SS | | | Had to clean hole to 87.0' then drill with 20.0' of core barrel to 100.0'. Only 95.0-100.0' is native undisturbed. | |
| 95.0 | | | | | | | |
| | | | PA | | | | |
| 100.0 | | | | | | 100.0 | |
| | | | | | | End of Boring<br>Backfilled with bentonite chips (25 bags)<br>Boring logged by: L. Beem<br>Casing: 7.0" I.D. | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1389459 | BORING STARTED 10/2/11 | AECOM OFFICE Denver | |
| EASTING 2268095 | BORING COMPLETED 10/3/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL 21.5-27.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR3** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,854.0 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | Strata depth | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| 0.0 | 1 | SS | | FILL - Silty GRAVEL (GM) - latite boulder rock fragments angular - moist - brown (mine waste) |
| | | PA | | Some clay from 4.0-5.0'<br>No SPT at 5.0' because of cobbles/boulders |
| 5.0 | 2 | SS | 5.0 | FILL - Clayey GRAVEL (GC) - extremely dense - moist - tan then brown with depth (mine waste) |
| | | PA | | Backfill demolition debris at 9.0' |
| 10.0 | 3 | SS | | |
| | | PA | | Sludge, black, wet, septic/wastewater odor - metal debris<br>Clayey gravel - wet - yellow staining<br>Rock fragments up to cobble size at 14.0'<br>No SPT - demolition debris |
| 15.0 | 4 | SS | | Clayey gravel with dolomite clasts cobble size - pyrite or dolomite - moist - gray changing to red |
| | | PA | 17.5 | FILL - Sandy GRAVEL (GW) - moist - yellow and tan (possible staining noted on cobbles from mine tunnel water) |
| | | | 19.0 | FILL - Well sorted SAND (SP) with latite cobbles - moist - reddish tan |
| 20.0 | 5 | SS | 20.0 | FILL - Clayey GRAVEL (GC), appears to be some calcine tailings - zone of galena deposits - extremely dense - very moist - red, yellow, brown (possible staining noted on cobbles from mine tunnel water)<br>Latite boulders up to 7" in diameter<br>Wet at 24.0' above latite boulder<br>Latite boulder |
| | | PA | | |
| 25.0 | 6 | SS | 26.0 | ALLUVIUM - Silty GRAVEL (GM) - well rounded river cobbles, latite and hermosa sandstone - up to 6" diameter - extremely dense - wet<br>>50 blows 0-6" at 26.0' |
| | | PA | 29.0 | Well graded GRAVEL (GW) |
| 30.0 | 7 | SS | 30.0 | Silty GRAVEL - wet - saturated - brown (GM) |
| | | | 31.0 | Well sorted SAND (SP), fine to medium grained - wet - salt and pepper color |
| | | | 31.5 | Silty CLAY (CL) - moist - brown (in SS shoe at 31.5') |
| | | PA | 32.0 | Silty GRAVEL (GM) - very dense to extremely dense - saturated - brown |
| 35.0 | | | | |

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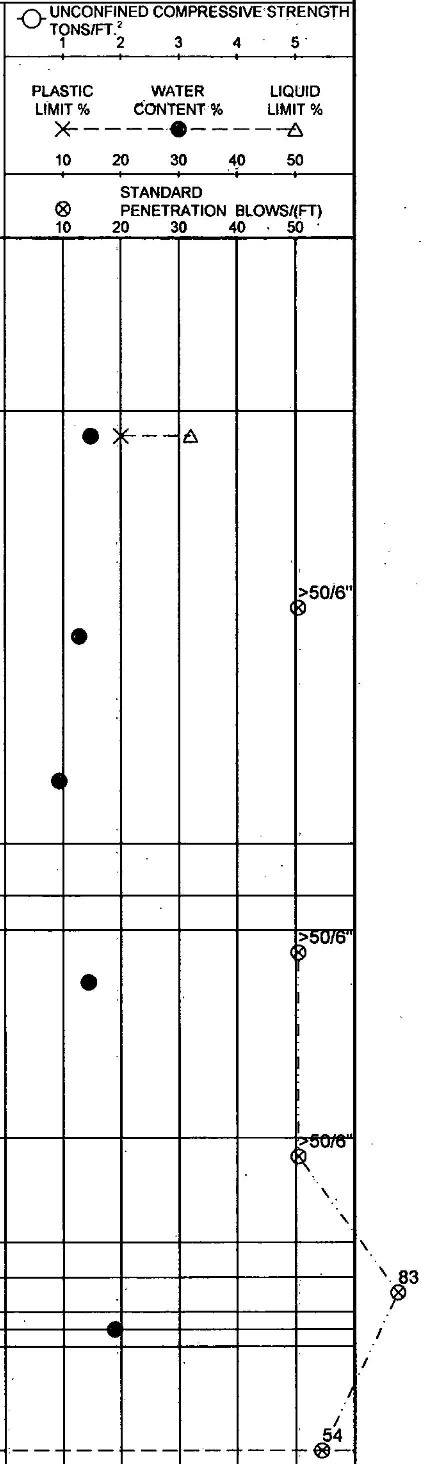


UNIT DRY WT. LBS./FT.³

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

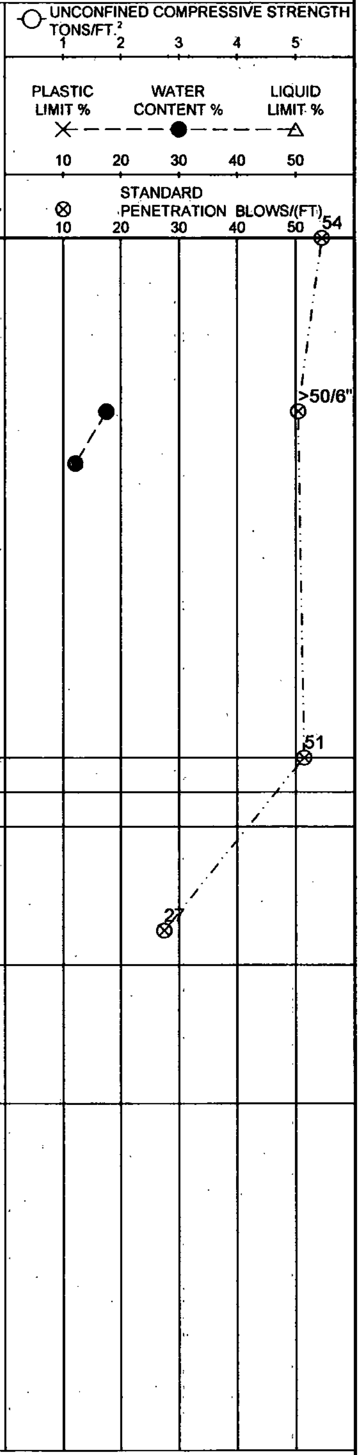
| AECOM JOB NO. | SHEET NO. | OF |
|---|---|---|
| 60157757 | 1 | 2 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR3** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,854.0 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.³ |
|---|---|---|---|---|---|---|---|---|
| | | 8 | SS | | | | Silty GRAVEL (GM) - very dense to extremely dense - saturated - brown | |
| | | | PA | | | | | |
| 40.0 | | | | | | | | |
| | | 9 | SS | | | | | |
| | | | | | | | Trace clay - cobbles | |
| | | | | | | | 43.0-44.0' - Increasing clay content | |
| 45.0 | | | PA | | | | | |
| | | | | | | | Decreasing clay, mostly silt - flowing - 8.0" cobbles | |
| | | | | | | 50.0 | Increasing clay - wet to very moist, noticeably drier<br>Small cobbles to pea gravel | |
| 50.0 | | 10 | SS | | | 51.0 | Silty CLAY with fine to coarse Sand (CL) - moist | |
| | | | | | | 52.0 | Poorly sorted SAND (SP) - fining upwards - wet (SP) | |
| | | | PA | | | | Silty GRAVEL (GM) - SS cobbles to 6" diameter - medium dense - wet - red - trace clay at 52.0', then grades to silt to 55.0'<br>Dolomite and red hermosa - SS cobble to 6.0" diameter | |
| 55.0 | | 11 | SS | | | 56.0 | | |
| | | | PA | | | 60.0 | Well graded GRAVEL to 3" diameter (GW) - coarse sand - saturated | |
| 60.0 | | | | | | | End of Boring<br>Hole sealed with bentonite (24 bags)<br>Boring logged by: L. Beem<br>Casing: 7.0" I.D. | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

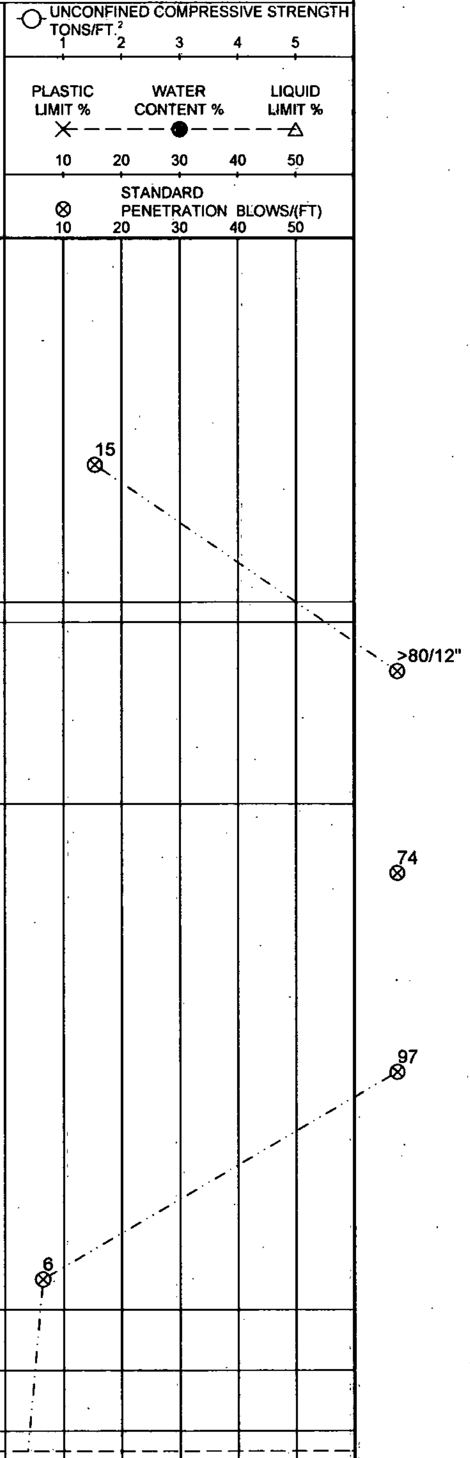
| | | | |
|---|---|---|---|
| NORTHING 1389791 | BORING STARTED 9/29/11 | AECOM OFFICE Denver | |
| EASTING 2268136 | BORING COMPLETED 9/30/11 | ENTERED BY SJH | SHEET NO. 2 OF 2 |
| WL 24.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR4** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,868.4 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | STRATUM DEPTH | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.³ | STANDARD PENETRATION BLOWS/(FT) |
|---|---|---|---|---|---|---|---|
| | | 1 | SS | | Silty GRAVEL (GM) with trace Clay and angular to subrounded cobbles 7" minus - medium dense - moist - tan and gray - possible landslide debris | | |
| | | | PA | | | | |
| 5.0 | | 2 | SS | | | | 15 |
| | | | PA | 9.0 | DOLOMITE boulder from 7.0-10.0' | | |
| | | | | 9.5 | POSSIBLE LANDSLIDE DEBRIS - Clayey SILT (ML) with trace pebble Gravel - moist - light brown | | |
| 10.0 | | 3 | SS | | POSSIBLE LANDSLIDE DEBRIS - Clayey GRAVEL (GC) - angular and subrounded cobbles 5" minus - extremely dense - moist - tan | | >80/12" |
| | | | PA | 14.0 | | | |
| 15.0 | | | | | POSSIBLE LANDSLIDE DEBRIS - Silty GRAVEL (GM) with cobble, subrounded and angular rock fragments - very dense to extremely dense (loose below 25.0') - moist - dark brown<br>DOLOMITE boulder with Pyrite vein | | |
| | | 4 | SS | | | | 74 |
| | | | PA | | | | |
| 20.0 | | 5 | SS | | | | 97 |
| | | | PA | | Numerous boulders<br>Changes in matrix color because of different cobbles and boulders | | |
| 25.0 | | 6 | SS | 26.5 | | | 6 |
| | | | PA | 28.0 | POSSIBLE LANDSLIDE DEBRIS - Silty CLAY (CL) with pebble size subrounded Gravel - wet | | |
| | | | | 29.5 | POSSIBLE BOTTOM OF LANDSLIDE DEBRIS - Silty GRAVEL (GM) with trace Clay at 28.0' then changing to all Silt - wet - contact with CL below at approximately 15 | | |
| 30.0 | | | | | . . . continued | | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 1 OF 4

|  |  |  |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR4** |
|  | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,868.4 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL |
|---|---|---|---|
|  | 7 | SS | degrees -<br>ALLUVIUM - Silty CLAY (CL) trace coarse Gravel and angular pebble Gravel - core in tact - very moist - brown-red - massive |
|  |  | PA | Angular to subangular rock fragments - latite |
| 35.0 | 8 | SS | >50 for 0-6" at 35.0' |
| 36.0 |  |  | Silty GRAVEL (GM) with trace Clay - angular cobbles 6" diameter, drilled through boulders - wet - red-brown |
|  |  | PA |  |
| 40.0 |  |  | Getting drier to 40.0' |
| 40.0 | 9 | SS | Clayey GRAVEL (GC) with boulders and angular fragments up to 3" diameter - extremely dense - wet - brown-red |
| 43.0 |  | PA | Silty GRAVEL (GM), with trace Clay - first notice of well rounded river cobbles - 4.5" minus - very dense to extremely dense - wet - red-brown<br>Yellow precipitate zone from 43.0-44.0' - drier, very moist |
| 45.0 | 10 | SS |  |
|  |  | PA |  |
| 50.0 | 11 | SS | >50 blows 6-12" at 50.5' |
| 52.0 |  | PA | Poorly sorted sand sized pebble subrounded gravel - wet - red-brown (SP) |
| 53.5 |  |  | Silty GRAVEL (GM) with trace Clay, trace cobbles 4" minus - extremely dense - wet - red-brown |
| 55.0 | 12 | SS |  |
| 56.5 |  | PA | Well sorted GRAVEL (GW) with trace Silt - 4" minus subrounded cobbles - wet - red-brown - groundwater producing zone |
| 58.0 |  |  | Clayey GRAVEL (GC) with some Silt - 4-5" minus subround cobbles - dense - very moist - red-brown - noticeably drier to 60.0' |
| 60.0 |  |  |  |

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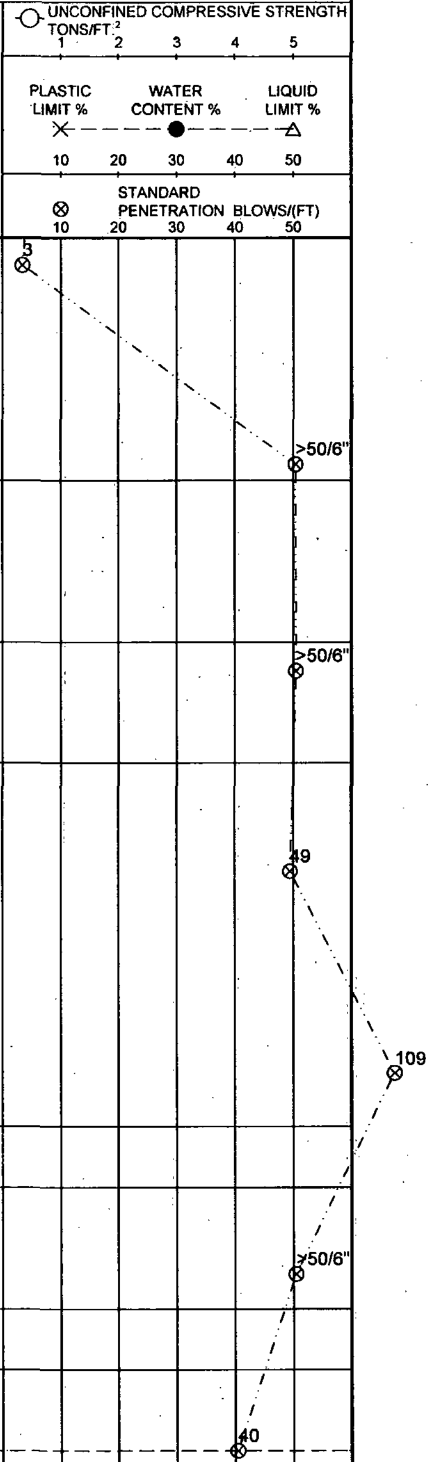


The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

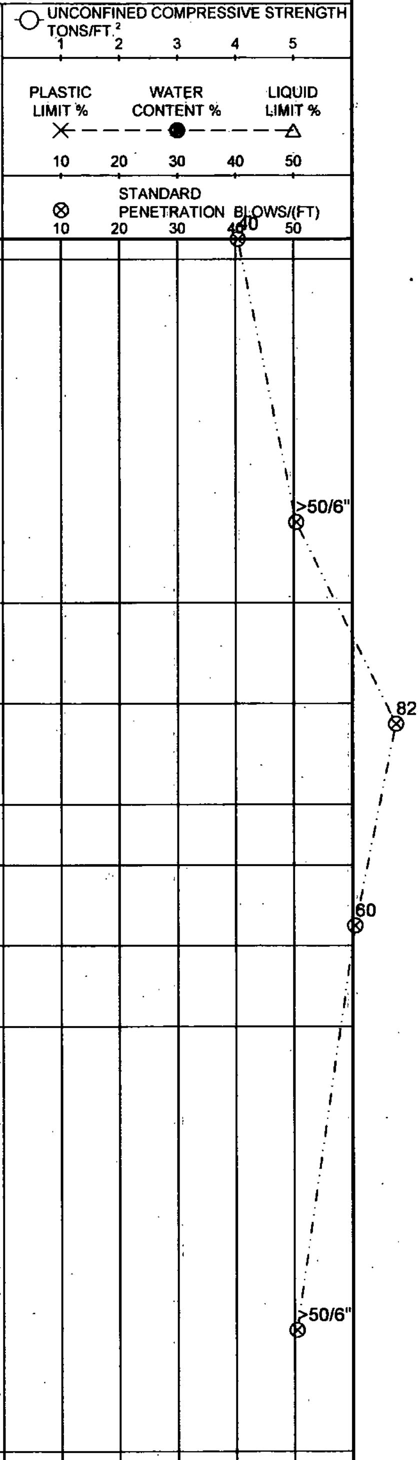
SHEET NO. 2 OF 4

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | | |
|---|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER | **NSR4** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** | |
| SITE LOCATION | | | |

SURFACE ELEVATION +8,868.4 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL | STANDARD PENETRATION BLOWS/(FT) |
|---|---|---|---|---|
| 60.5 | 13 | SS | Silty GRAVEL (GM) with trace Clay, fine to coarse Sand, pebble Gravel, rounded cobbles - extremely dense - wet - red-brown | 40 |
| | | PA | | |
| 65.0 | | | Changed sample interval to 62.0' and then every 5.0' to keep casing at TD of hole | |
| | 14 | SS | Cobble in shoe | >50/6" |
| 69.0 | | PA | Clayey GRAVEL (GC) - subrounded cobbles to 5" minus - very moist - increasingly wet with depth | |
| 70.0 | | | | |
| 71.5 | | | Well graded GRAVEL (GW) with trace Clay - pebble gravel, 3" minus - extremely dense - wet | |
| | 15 | SS | | 82 |
| 74.0 | | PA | Well sorted SAND (SW) with trace small pebble Gravel - wet | |
| 75.0 | | | | |
| 75.5 | | | Silty GRAVEL (GM) with trace Clay - more angular gravel 3" minus - very dense - wet - red-brown | |
| 77.5 | 16 | SS | Well graded GRAVEL (GW), trace Silt - silt increasing with depth - wet - light gray | 60 |
| 79.5 | | PA | Silty GRAVEL (GM), trace Clay, angular to subangular cobbles 4" minus - very moist | |
| 80.0 | | | | |
| | | | Hermosa boulder at 82.0' (2.0' thick) | |
| | | | Increasing clay<br>Most rock fragments are lower hermosa arkose and dolomite | |
| 85.0 | | | Angular cobbles and small boulders, hermosa arkose - increasing clay content - moist - light gray | |
| | 17 | SS | | >50/6" |
| | | PA | | |
| 90.0 | | | | |



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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| AECOM JOB NO. | SHEET NO. | OF |
|---|---|---|
| 60157757 | 3 | 4 |

|  |  |  |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **NSR4** |
|  | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$

SURFACE ELEVATION +8,868.4 Feet (Continued)

DOLOMITE, fractured, Clay in fractures, light gray

Light gray crystalline DOLOMITE

Void 92.0-94.0' - drill stem dropped

Fractured DOLOMITE and Clay (possible failure plane)

95.0

DOLOMITE heavily fractured with Clay infill - not re-cemented (possible landslide fracture plane)

100.0 — 100.0 DOLOMITE core fractured by sonic drill

End of Boring
Boring logged by: L. Beem
Casing: 7.0" I.D.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

|  |  |  |  |
|---|---|---|---|
| NORTHING 1389778 | BORING STARTED 9/27/11 | AECOM OFFICE Denver |  |
| EASTING 2268243 | BORING COMPLETED 9/28/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL 26.5' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

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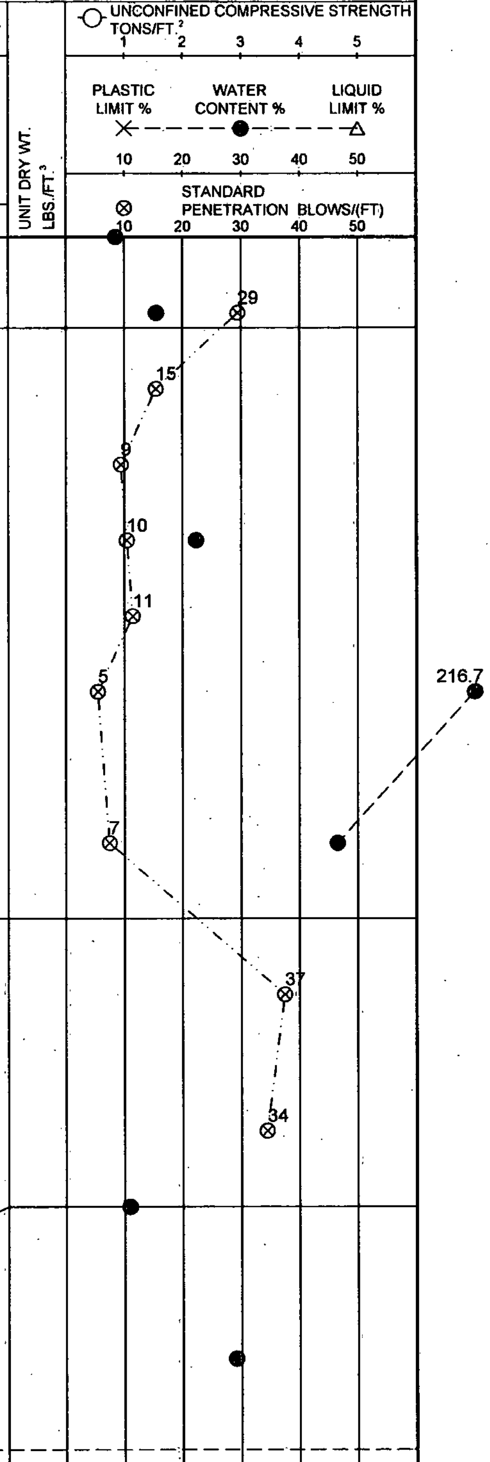
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **PDF-1** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | |

SURFACE ELEVATION +8,831.6 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| | | | GB | PDF DIKE FILL - Silty Sandy GRAVEL (GW) - subrounded to rounded - medium dense - moist |
| 3.0 | | 1 | GB | FILL - Calcines - Silty fine SAND (SM), sized est. <10% silt - reddish purple (no munsell color) - moist - medium dense to loose |
| 5.0 | | | GB | |
| | | 2 | GB | |
| | | | GB | |
| | | 3 | GB | |
| 10.0 | | | GB | |
| | | 4 | GB | |
| | | | GB | |
| | | 5 | GB | |
| 15.0 | | | GB | Becoming wet at 14.5' |
| | | 6 | GB | |
| | | | GB | |
| 20.0 | | 7 | GB | |
| 22.5 | | | GB | ALLUVIUM - Silty Sandy Cobbly GRAVEL (GW) - approximately 5% cobbles to 4.5", 55% gravel, 30% sand and 10% silt fines - predom. subrounded to well-rounded gravel - bluish black 2 GLEY 2.5/5PB- black color does not appear to be organic, rather appears to be chem related to calcines - dense - wet |
| 25.0 | | 8 | GB | 25.0-30.5' - Core sample appears to contain calcines from above - using water to prevent heaving in drill casing - sampling alluvial material only |
| | | | GB | |
| 30.0 | | 9 | GB | Becomes dark olive green 5Y 3/2 |
| | | | GB | Mix of units from 22.5-30.0' and 32.0'+ |
| 32.0 | | | GB | ALLUVIUM - Gravelly Silty SAND (SW) - subrounded to rounded gravels - gravels up to 1.5" - strong brown 7.5YR 5/8 - wet<br>35.0': Becomes dark yellowish brown 10YR 4/6 |
| 35.0 | | | | |
| 40.0 | | | GB | |



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AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

AECOM JOB NO. 60157757

| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **PDF-1** |
|---|---|---|
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

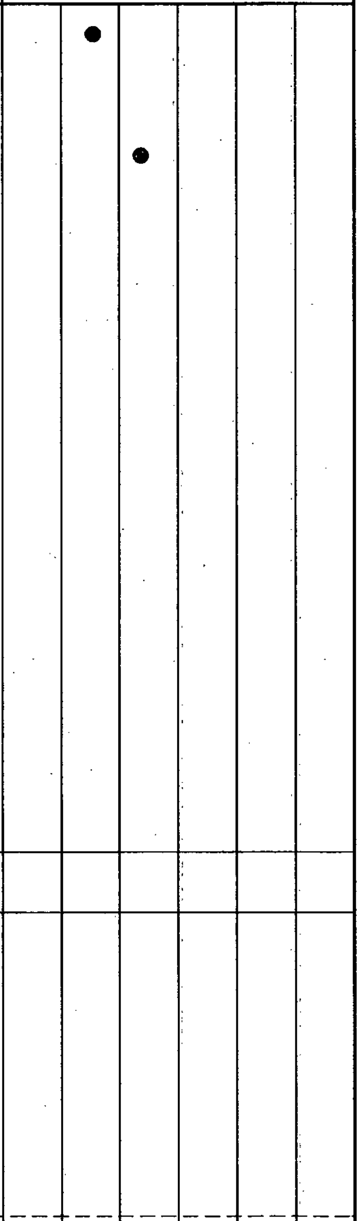
PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

UNIT DRY WT. LBS./FT.$^3$

SURFACE ELEVATION +8,831.6 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|---|---|
| | | | GB | | | ALLUVIUM - Gravelly Silty SAND (SW) - subrounded to rounded gravels - gravels up to 1.5" - strong brown 7.5YR 5/8 - wet<br>40.0': Dark yellowish brown 10YR 4/6 |
| 45.0 | | | GB | | | Mostly fine sand, gravels reduce to <5%, approximately 5% silt - yellowish red 5YR 4/6 (SP)<br>Grades to silty fine sand with approximately 10% silt fines - reddish brown 2.5YR 4/8 (SP-SM) |
| 50.0 | | | | | | Subangular to subrounded, medium and coarse sands - fines <5% (SP) |
| 55.0 | | | GB | | | Transitions back to silty fine sand - approximately 10% fines (SP-SM) |
| 60.0 | | | | | | |
| 65.0 | | | GB | | | |
| 68.0 | | | GB | | | Fine Sandy CLAY (CL) - dark reddish gray 2.5YR 4/1 - moderately plastic - moist |
| 70.0 | | | | | | Transitions to Silty fine SAND (SP) - weak red 2.5YR 4/2 - approximately <5% fines |
| 75.0 | | | GB | | | Transitions to reddish brown 2.5YR 4/3 |
| 80.0 | | | | | | |



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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757 SHEET NO. 2 OF 3

AECOM

| | | |
|---|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **PDF-1** | |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** | |
| SITE LOCATION | | |

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %
10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,831.6 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | | | | Transitions to Silty fine SAND (SP) - weak red 2.5YR 4/2 - approximately <5% fines | |
| 85.0 | | | GB | | | | |
| 90.0 | | | GB | | | 92.0 | |
| | | | | | | Silty fine SAND (SM) - predom. approximately 15% silt with 6.0" layer at 93.0' and 99.0' of 25% silt and dark reddish gray 2.5YR 4/1 - generally reddish brown 2.5YR 4/3 | |
| 95.0 | | | GB | | | | |
| 100.0 | | | | | | 100.0 | |
| | | | | | | End of Boring<br>Backfilled with bentonite (19 bags)<br>Boring logged by: A. Jewell<br>Casing: 5.5" I.D.<br>No water available - frozen pump | |

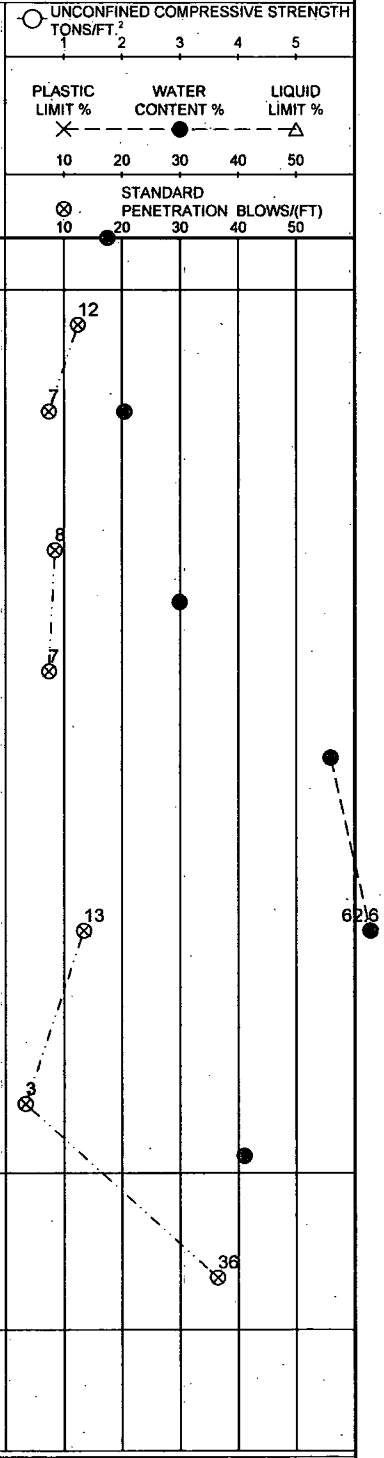
The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388479 | BORING STARTED 10/6/11 | AECOM OFFICE Denver | |
| EASTING 2267812 | BORING COMPLETED 10/6/11 | ENTERED BY SJH | SHEET NO. 3 OF 3 |
| WL 14.5' WD | RIG/FOREMAN MINI-SONIC C100/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **PDF-2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,838.9 Feet | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | GB | | | FILL - Wasterock/colluvium intermixed with calcines - COLLUVIUM FRACTION - Clayey Gravelly SAND (SP-SM) - gravels to 2.0" or larger - subangular - reddish purple (no munsell) | |
| 1.5 | | 1 | GB | | | CALCINES - Silty fine SAND (SM) sized - black - medium dense to very dense - slightly moist to moist Alternating colors from black to reddish purple - color changes do not appear to be in clearly defined layers | |
| 5.0 | | | GB | | | | |
| | | 2 | GB | | | | |
| | | 3 | ST | | | Becoming coarse grained at 6.5' | |
| 10.0 | | 4 | GB | | | | |
| | | | GB | | | | |
| | | 5 | GB | | | | |
| 15.0 | | | GB | | | | |
| | | 6 | ST | | | | |
| | | | GB | | ▼ | Becoming wet at 18.0' | |
| 20.0 | | 7 | GB | | | Becoming slightly coarser grained | |
| | | | GB | | | | |
| 25.0 | | 8 | GB | | | | |
| 27.0 | | | GB | | | ALLUVIUM OR CALCINE/ALLUVIUM MIX - Silty Sandy Cobbly GRAVEL (GW-GM) - approximately 50% gravel 35 % sand and 15% silt fines - cobbles to 3.0" or larger - subrounded to subangular - reddish purple color of calcines to approx. 28.0' - dense - becoming alluvium at approx. 28.0' very dark gray - wet | |
| 30.0 | | 9 | GB | | | | |
| 31.5 | | | | | | End of Boring<br>Backfilled with bentonite (13 bags)<br>Boring logged by: A. Jewell<br>Casing: 5.5" I.D. | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

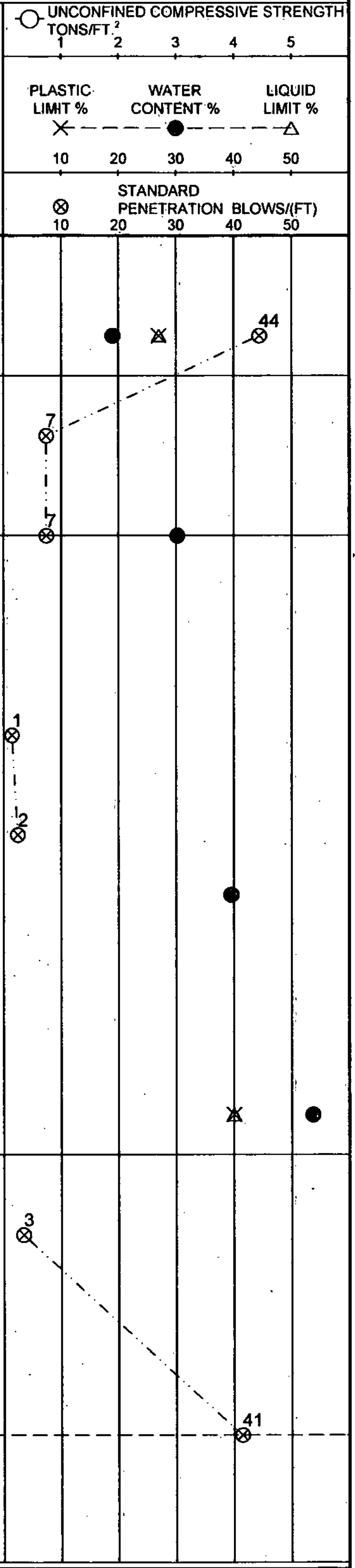
| | | | |
|---|---|---|---|
| NORTHING 1388696 | BORING STARTED 10/10/11 | AECOM OFFICE Denver | |
| EASTING 2267862 | BORING COMPLETED 10/10/11 | ENTERED BY SJH | SHEET NO. 1 OF 1 |
| WL 18.0' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **PDF-3** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | |

SURFACE ELEVATION +8,830.8 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | GB | | | PDF EMBANKMENT FILL - Silty Sandy GRAVEL (GW) - approximately 50% gravel, 40% sand and 5-10% silt - subrounded to subangular - some scattered clumps with moderate plasticity | |
| | | 1 | GB | | | 3.5 | |
| | | | GB | | | FILL - Cobbly Sandy Clayey GRAVEL (GC) - man made debris - approximately 40% sand, 40% gravel and 20% fines - cobbles to 4.0" - dark reddish brown 5YR 3/3 - loose | |
| 5.0 | | 2 | GB | | | Clumps with up to 40% clay at 6.0-6.5' | |
| | | | GB | | | Becomes mixed with calcines at 7.0'<br>7.5 | |
| | | 3 | ST | | | FILL - CALCINES - fine sand and silt sized (SM) - approximately 10% fines - reddish purple (no munsell color) - very loose<br>8.0-8.5' - Wet saturated layer - up to 30% silt - low plasticity | |
| 10.0 | | 4 | GB | | | General increase in silt content similar to 8.0-8.5' at 10-12.5' | |
| | | | GB | | | | |
| | | 5 | GB | | ▼ | No representative core sample due to hole cave | |
| | | | GB | | | | |
| 15.0 | | 6 | GB | | | | |
| | | | GB | | | Attempted shelby tube - no recovery - hit rock at 24.0' | |
| 20.0 | | 7 | ST | | | Attempted shelby tube - no recovery - moving to SPT at 25.0'<br>Core bag ripped - no recovery from 20.0-22.5' | |
| | | | GB | | | 23.0<br>ALLUVIUM - Organic Silty SAND (ML-OL) - decayed plant fibers - some medium to coarse angular sand layers - organic smell - very loose to dense - wet | |
| 25.0 | | 8 | GB | | | No core recovery from 25.0-30.0' | |
| | | | GB | | | | |
| 30.0 | | | | | | . . . continued | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | |
|---|---|---|
| AECOM JOB NO. 60157757 | SHEET NO. 1 | OF 2 |

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **PDF-3** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

-O- UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % X, WATER CONTENT % ●, LIQUID LIMIT % △ — 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,830.8 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| 31.5 | | 9 | GB | | | 31.5 Possible silty sandy cobbly gravel alluvium contact at 31.0' - inferred rock - no rock in tip | |
| | | | | | | End of Boring<br>Backfilled with bentonite (8 bags)<br>Boring logged by: A. Jewell<br>Casing: 5.5" I.D. | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388223 | BORING STARTED 10/10/11 | AECOM OFFICE Denver | |
| EASTING 2268083 | BORING COMPLETED 10/10/11 | ENTERED BY SJH | SHEET NO. 2 OF 2 |
| WL 14.0' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

CLIENT
**Atlantic Richfield Company**

PROJECT NAME
**Rico-Argentine Site - OU01**

LOG OF BORING NUMBER **SSR1**

ARCHITECT-ENGINEER
**Drilling Company: Boart Longyear**

SITE LOCATION

SURFACE ELEVATION +8,863.5 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | STRATUM DEPTH | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| | 1 | SS | | Gravelly lean CLAY (CL) - angular gravel, cobbles - medium dense - damp - brown (talus) |
| | | PA | | |
| 5.0 | 2 | SS | | Siltier - dark brown |
| | | PA | | Flat talus chips<br>Cobbles - boulders |
| 10.0 | | | 10.5 | |
| | 3 | SS | | Clayey GRAVEL (GC) - angular gravel to cobbles - medium dense - damp - brown |
| | | PA | 14.0 | Subrounded gravel to cobbles |
| 15.0 | | | | Very Gravelly SILT with Sand (ML) - subrounded gravel, 2" minus - dense - damp - brown |
| | 4 | SS | 16.0 | |
| | | | | Gravelly CLAY with Sand (CL) - subangular gravel, 3" minus - damp - brown (CL) |
| | | PA | | Cobble/boulder |
| 20.0 | | | 20.0 | Yellow staining |
| | 5 | SS | | Silty GRAVEL with Sand (GM) - subrounded gravel to cobble/boulder - medium dense - damp - brown |
| | | | 22.0 | ALLUVIUM - Gravelly lean CLAY with Sand (CL) - subrounded gravel to cobble - dense - damp - red-brown |
| | | PA | | Yellow staining, black staining, angular gravel |
| 25.0 | 6 | SS | | |
| | | PA | | Fat clay, less yellow staining, no black staining, less gravel (CH) |
| 30.0 | | | 30.0 | |

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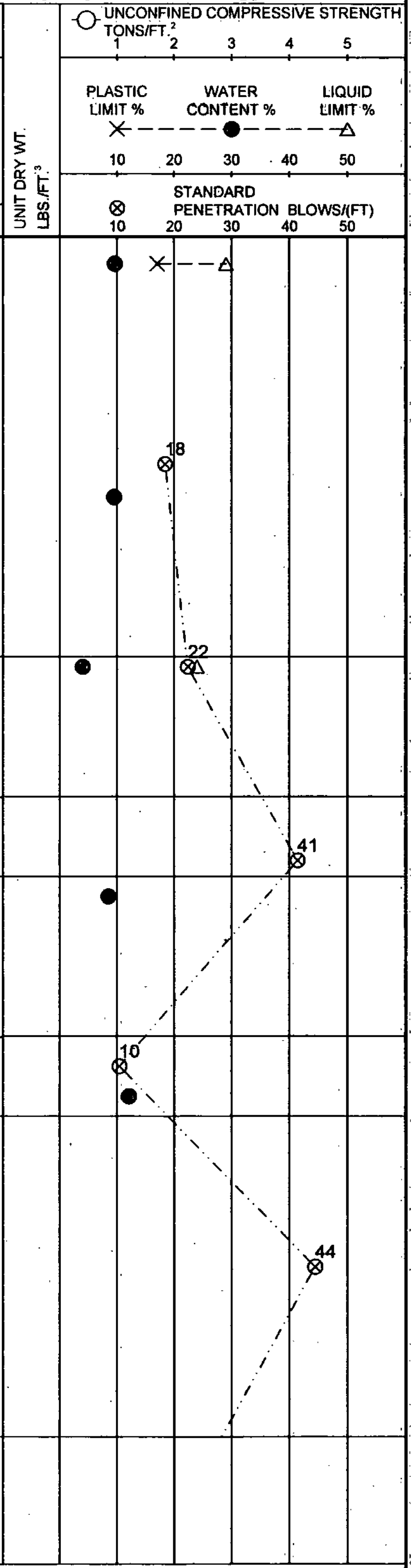

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 1 OF 4

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR1** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | | |

SURFACE ELEVATION +8,863.5 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| | | 7 | SS | Gravelly CLAY with Sand (CL) - subangular gravel, 4" minus - wet - loose to dense - red-brown - yellow staining around 30.0', plastic (talus) |
| | | | PA | Same with cobbles<br>Less plastic with boulder |
| 35.0 | | | | |
| | | 8 | SS | |
| | | | PA | Yellow staining<br>Boulder |
| 40.0 | | | | |
| | | 9 | SS | 42.0 |
| | | | PA | Clayey GRAVEL with coarse Sand (GC) - subangular gravel, few 4" minus cobbles - wet - red-brown - yellow staining<br>43.5 ALLUVIUM - Well graded GRAVEL with Sand (GW) - subrounded gravel, 3" minus - grades less sand with cobbles - wet - red-brown<br>45.0 |
| 45.0 | | | | |
| | | 10 | SS | Well graded SAND with Gravel (SW) - subrounded gravel, 1" minus grades with cobbles - wet - medium dense - red-brown - upward fining sequence in shoe<br>46.0 |
| | | | PA | Gravelly fat CLAY, few coarse Sand, some angular Gravel (CL) - subrounded gravel and cobbles - wet - red-brown - cobbles are (hermosa SS)<br>50.0 |
| 50.0 | | | | |
| | | 11 | SS | Clayey GRAVEL with Sand (GC) - subrounded, 4" minus gravel with cobbles - extremely dense - wet - red-brown (talus)<br>52.0 |
| | | | PA | Well graded GRAVEL with Sand (GW) - subrounded gravel, 2" minus grades to cobbles with less sand - wet - brown<br>More sand<br>More cobbles<br>57.0 |
| 55.0 | | | | |
| | | 12 | SS | ALLUVIUM - Well graded SAND (SW) - extremely dense - wet - red-brown<br>58.0<br>58.5 Well graded GRAVEL (GW) - angular, 1" minus - wet - red-brown |
| 60.0 | | | | |

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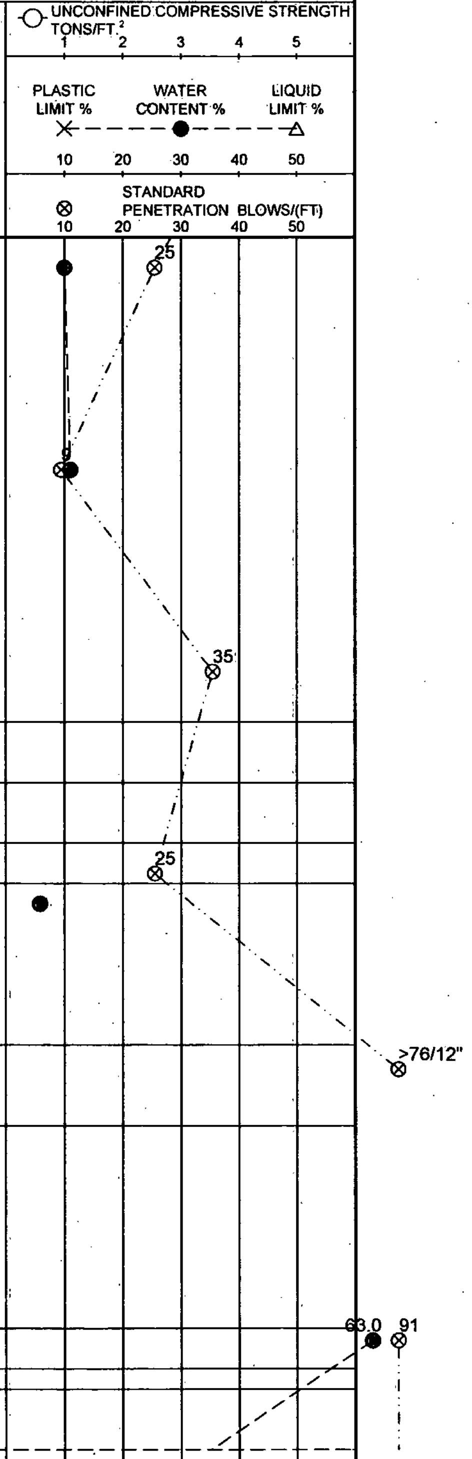
UNIT DRY WT. LBS./FT.$^3$



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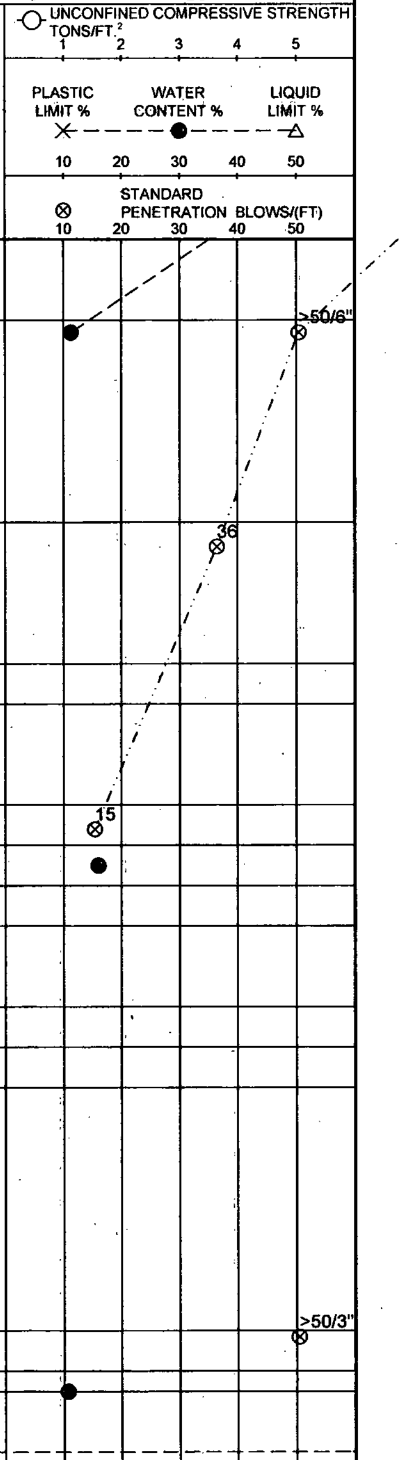
|---|---|---|
| The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual. | AECOM JOB NO. 60157757 | SHEET NO. 2 OF 4 |

**AECOM**

| | |
|---|---|
| CLIENT | **Atlantic Richfield Company** |
| LOG OF BORING NUMBER | **SSR1** |
| PROJECT NAME | **Rico-Argentine Site - OU01** |
| ARCHITECT-ENGINEER | **Drilling Company: Boart Longyear** |
| SITE LOCATION | |

SURFACE ELEVATION +8,863.5 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL | | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|
| | | | PA | Clayey GRAVEL with Sand (GC) - subrounded gravel, 4" minus with cobbles - wet - red-brown<br>With yellow staining | 62.0 | |
| | | 13 | SS | Silty GRAVEL with Sand (GM) - subrounded gravel/cobbles - extremely dense - wet - red-brown | | |
| 65.0 | | | PA | Cobble/boulder in bit - recovered 1.0' below cobble and 1.0' above from drill deck | 67.0 | |
| | | 14 | SS | Poorly graded SAND (SP), very fine to fine - dense - wet - red-brown | | |
| 70.0 | | | PA | Grades to medium sand<br>Grades to coarse sand | 70.5 | |
| | | | | Well graded GRAVEL with Clay and Sand (GW-GC) - wet - red-brown - subrounded gravel 2" minus | 71.5 | |
| | | | | Poorly graded SAND (SP) - wet - red brown - very fine to fine<br>73.0' - Grades to medium sand<br>73.5' - Grades to coarse sand | 74.0 | |
| 75.0 | | 15 | SS | Well graded GRAVEL with Sand, coarse Sand, trace Silt (GW) - subangular to subrounded gravel, 2" minus - medium dense - wet - red-brown | 75.0 | |
| | | | PA | Well graded SAND with Gravel, trace Silt (SW-SM) - subrounded gravel, 3" minus - wet - red-brown | 76.0 | |
| | | | | Very fine Silty SAND (SM) - wet - red-brown | 77.0 | |
| | | 16 | SS | Well graded SAND (SW) - grades fine to coarse - some rounded gravel, 1"minus - wet - red-brown - saturated - clean | 79.0 | |
| 80.0 | | | PA | Poorly graded coarse SAND (SP) - wet - red-brown | 80.0 | |
| | | | | Well graded Sandy GRAVEL, trace Silt (GW) - rounded, 2" minus - wet - red-brown (GW) | 81.0 | |
| | | 17 | SS | Well graded SAND, minimal fine Sand (SW) - grades coarser with rounded gravel, 1" minus - wet - red-brown - clean | | |
| 85.0 | | | PA | Color change in matrix to dark gray brown | 87.0 | |
| | | 18 | SS | Poorly graded SAND (SP) - grades fine to coarse - wet - red-brown | 88.0 | |
| | | | | Well graded GRAVEL with Sand (GW) - 2" minus gravel - wet - red-brown (talus) | 88.5 | |
| 90.0 | | | | | | |



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The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| AECOM JOB NO. | SHEET NO. | OF |
|---|---|---|
| 60157757 | 3 | 4 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR1** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

SURFACE ELEVATION +8,863.5 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | PA | | | Well graded SAND, minimal fine Sand (SW) - rounded grains - saturated - dark gray-brown<br>Fine sand, red-brown - saturated<br>Dark gray-brown with cobbles | |
| | | 19 | SS | | | | |
| 94.0 | | | | | | Well graded GRAVEL with Sand (GW) - subrounded gravel-cobble - wet - gray-brown | |
| 95.0 | | | | | | | |
| 95.5 | | | | | | Poorly graded SAND with Silt, very fine Sand (SP-SM) - wet - gray-brown (SP-SM) | |
| 97.5 | | | | | | Poorly graded SAND, fine Sand (SP) - wet - gray-brown | |
| 100.0 | | | | | | End of Boring.<br>Boring logged by: S. Johnston<br>Casing: 7.0" I.D. | |

The stratification lines represent the approximate boundary lines between soil types: in-situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388874 | BORING STARTED 10/9/11 | AECOM OFFICE Denver | |
| EASTING 2268226 | BORING COMPLETED 10/10/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL 44.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | | |
|---|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER | **SSR2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** | |

SITE LOCATION

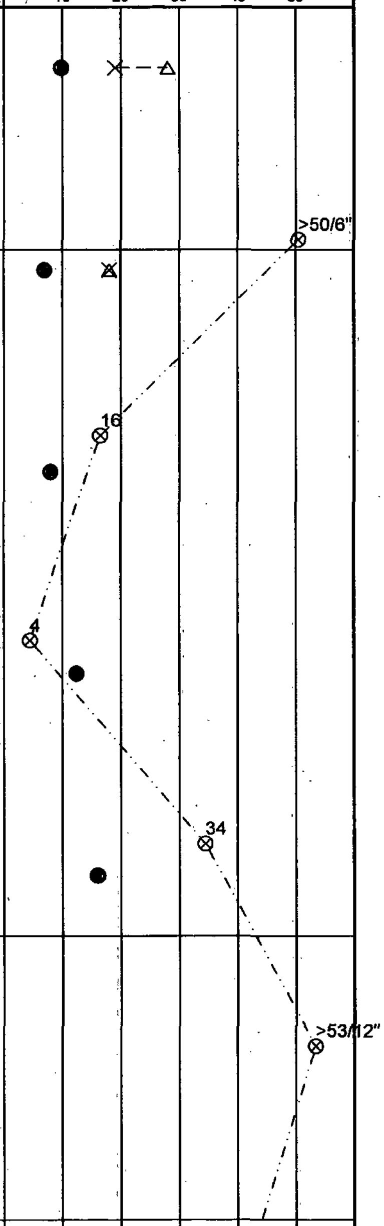
UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % × · WATER CONTENT % ● · LIQUID LIMIT % △ · 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

SURFACE ELEVATION +8,850.3 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|
| | | 1 | SS | Clayey SILT with angular Gravel (ML) - extremely dense - dry - brown (talus) | |
| | | | PA | | |
| 5.0 | | | | | |
| | | 2 | SS | 6.0 | |
| | | | | Lean CLAY with angular Gravel and cobbles 5" minus (CL) - loose to dense - dry - brown | |
| | | | PA | | |
| 10.0 | | | | | |
| | | 3 | SS | | |
| | | | PA | | |
| 15.0 | | | | | |
| | | 4 | SS | Cobble/boulder | |
| | | | PA | | |
| 20.0 | | | | | |
| | | 5 | SS | | |
| | | | | SS cobble/boulder | |
| | | | | 23.0 | |
| | | | PA | POSSIBLE ALLUVIAL FAN DEPOSIT? - CLAY with Gravel (CL) - extremely dense - damp - red-brown with dark brown staining | |
| 25.0 | | | | | |
| | | 6 | SS | | |
| | | | | 12" boulder | |
| | | | PA | Angular gravel/cobble 4" minus | |
| 30.0 | | | | 30.0 | |



. . . continued

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

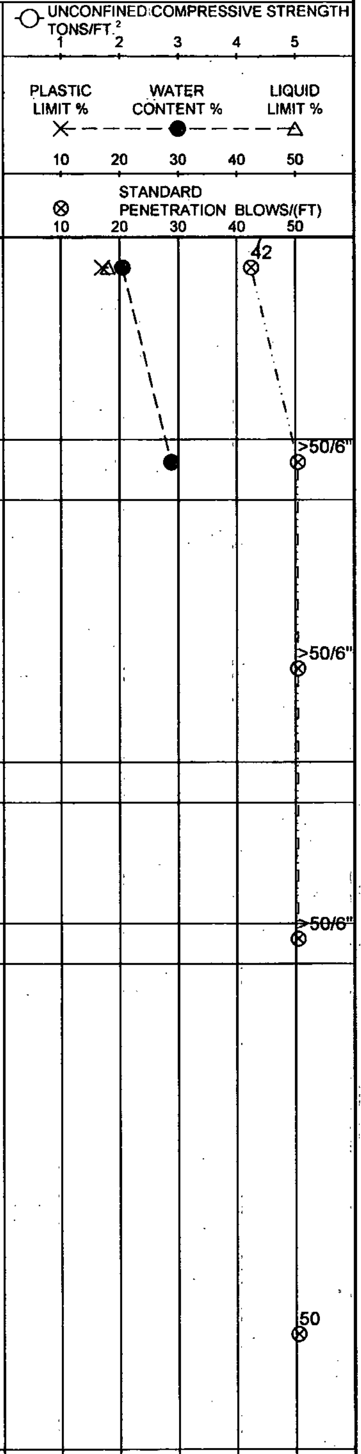
SHEET NO. 1 OF 4

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | | |

SURFACE ELEVATION +8,850.3 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | 7 | SS | | | Gravelly CLAY (CL) - talus - very moist - brown - medium-high plasticity (possibly CH) | |
| | | | PA | | | Cobble/boulder | |
| 35.0 | | | | | | 35.0 | |
| | | 8 | SS | | | Clayey GRAVEL with Sand (GC) - extremely dense - wet - brown | |
| | | | | | | 36.5 | |
| | | | PA | | | Silty GRAVEL with Sand (GM) - extremely dense - wet - brown<br>Cobble/boulder 6" plus | |
| 40.0 | | 9 | SS | | | Saturated | |
| | | | | | | 43.0 | |
| | | | PA | | | ALLUVIUM - Well graded SAND with Gravel (SW) - subrounded gravel-cobble 4" minus - wet - red-brown | |
| | | | | | | 44.0 | |
| 45.0 | | | | | | Well graded Sandy GRAVEL (GW) - subrounded gravel-cobble 5" minus - wet - red-brown | |
| | | | | | | 47.0 | |
| | | 10 | SS | | | Gravelly CLAY with Sand (CL) - subangular to subrounded gravel 3" minus - extremely dense - wet - red-brown - trace silt | |
| | | | | | | 48.0 | |
| 50.0 | | | PA | | | Well graded GRAVEL with Sand, trace Silt (GW) - subangular to subrounded gravel 3" minus - very dense - wet - red-brown | |
| | | 11 | SS | | | | |
| 55.0 | | | PA | | | Saturated | |
| | | 12 | SS | | | | |
| 60.0 | | | | | | 60.0 | |

. . . continued



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

| | | | |
|---|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR2** | |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** | |

SITE LOCATION

SURFACE ELEVATION +8,850.3 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL | BOTTOM OF STRATUM (FT) | UNIT DRY WT. LBS./FT.³ | WATER CONTENT % (PLASTIC LIMIT % / LIQUID LIMIT %) | STANDARD PENETRATION BLOWS/(FT) |
|---|---|---|---|---|---|---|---|---|
| | | | PA | Silty GRAVEL, with little Sand, trace Clay (GM) - subrounded gravel 3" minus - wet - red-brown - saturated | 62.0 | | | |
| | | 13 | SS | Poorly graded SAND, trace Clay (SP) - very fine to fine - wet - red-brown (SP) | 64.0 | | ● | |
| | | | | Well graded SAND with Gravel, trace Silt (SW) - subrounded gravel 2" minus - wet - red-brown | 65.0 | | | |
| 65.0 | | | PA | Silty GRAVEL with Sand (GM) - subrounded gravel 2" minus - grades to clayey gravel - wet - red-brown | 67.0 | | | |
| | | 14 | SS | Well graded GRAVEL with Silt and Sand (GW-GM) - rounded gravel-cobble 4" minus - very dense - wet - red-brown - saturated | | | | 79 |
| 70.0 | | | PA | | 72.0 | | | |
| | | 15 | SS | Poorly graded, fine SAND (SP) - very dense - wet - red-brown - saturated | 73.5 | | ● | 51 |
| | | | | Well graded SAND with Gravel, trace Silt (SW) - wet - red-brown | 74.0 | | | |
| 75.0 | | | PA | Silty GRAVEL with Sand (GM) - rounded gravel-cobble 4" minus - wet - red-brown | 77.0 | | | |
| | | 16 | SS | Well graded SAND with Gravel, trace Silt (SW) - subrounded gravel 1" minus - wet - red-brown | 77.5 | | | 62 |
| | | | | Silty GRAVEL with Sand (GM) - subrounded subangular gravel 2" minus - very dense - wet - red brown | 80.5 | | | |
| 80.0 | | | PA | Well graded SAND, trace Gravel (SW) - wet - red-brown | 81.5 | | | |
| | | | | Well graded GRAVEL, trace fines or Sand (GW) - subrounded to subangular gravel 2" minus - wet - red-brown | 82.0 | | | |
| | | 17 | SS | Well graded GRAVEL with Sand (GW) - subrounded to rounded gravel 2" minus - extremely dense - wet - red-brown - saturated | 85.0 | | | >95/12" |
| 85.0 | | | PA | Well graded GRAVEL with Silt and Sand (GW-SM) - rounded gravel-cobbles 4" minus - wet - red-brown - saturated | 87.0 | | | |
| | | 18 | SS | Well graded SAND, few Gravel, trace Silt (SW) - round 1" minus gravel - wet - red-brown | 90.0 | | | |
| 90.0 | | | | | | | | |

. . . continued

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 3 OF 4

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR2** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5

PLASTIC LIMIT % × — WATER CONTENT % ● — LIQUID LIMIT % △ 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,850.3 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | PA | | | Well graded SAND with Gravel (SW) - rounded 2" minus gravel - wet - red-brown | |
| | | 19 | SS | | | | |
| | | | | | | 94.0 | |
| 95.0 | | | | | | Poorly graded fine SAND with Silt (SP-SM) - few .5" minus gravel - wet - red-brown | |
| | | | | | | 96.0 | |
| | | | PA | | | Poorly graded SAND (SP) - few .5" minus gravel - wet - red-brown | |
| 100.0 | | | | | | 100.0 | |

End of Boring
Drilled from 87.0' to 100.0' with no SPT
Boring logged by: S. Johnston
Casing: 7.0" I.D.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388666 | BORING STARTED 10/7/11 | AECOM OFFICE Denver | |
| EASTING 2268236 | BORING COMPLETED 10/9/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL 35.5' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

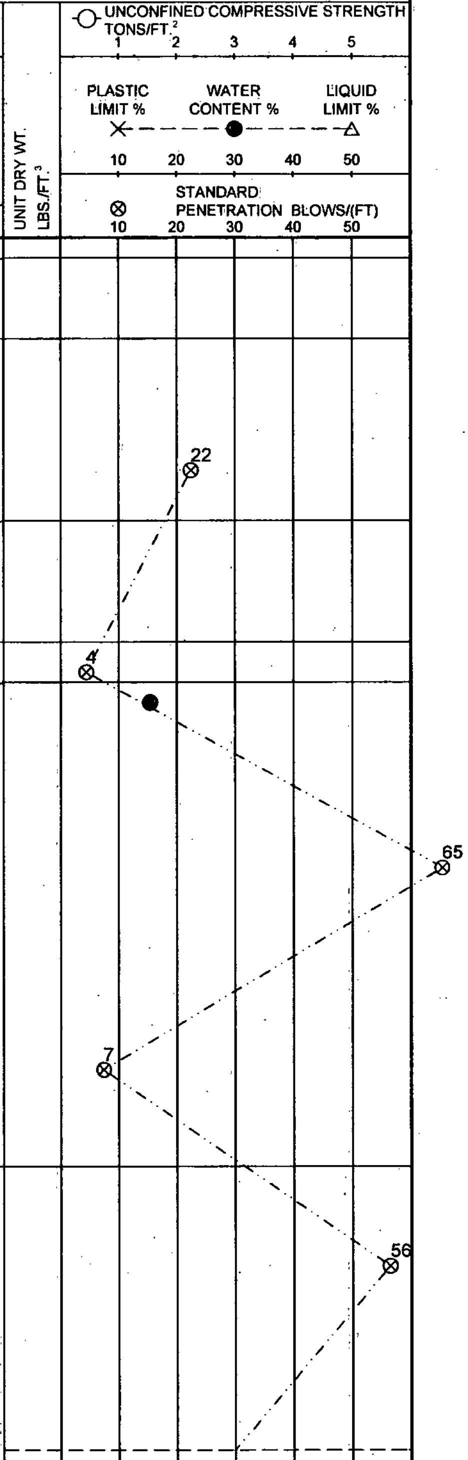
AECOM

| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR3** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | |

SURFACE ELEVATION +8,849.3 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| | | 1 | SS | 0.5 CONCRETE pad |
| | | | | Well graded GRAVEL with Clay and Sand (GW-GC) - subangular to subrounded 3" minus gravel - wet - brown |
| | | | PA | 2.5 Well graded GRAVEL with Sand (GW) - angular to rounded gravel-cobbles 6" minus - medium dense - dry - brown |
| 5.0 | | 2 | SS | |
| | | | | 7.0 Damp |
| | | | PA | Gravelly CLAY with Sand (GC) - subangular gravel - cobble 4" minus - damp - brown |
| 10.0 | | 3 | SS | 10.0 Well graded GRAVEL with Sand (GW) - subangular to rounded - wet - brown - loose - saturated |
| | | | | 11.0 Gravelly CLAY with Sand (CL) - gravel to cobbles - subangular to subrounded 5" minus - very dense to loose - damp - brown |
| | | | PA | |
| 15.0 | | 4 | SS | |
| | | | PA | |
| 20.0 | | 5 | SS | Less cobbles |
| | | | PA | 23.0 Clayey GRAVEL with Sand (GC) - gravel to cobbles - subangular to subrounded 5" minus - very dense to medium dense - damp - brown |
| 25.0 | | 6 | SS | |
| | | | PA | |
| 30.0 | | | | |

. . . continued



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

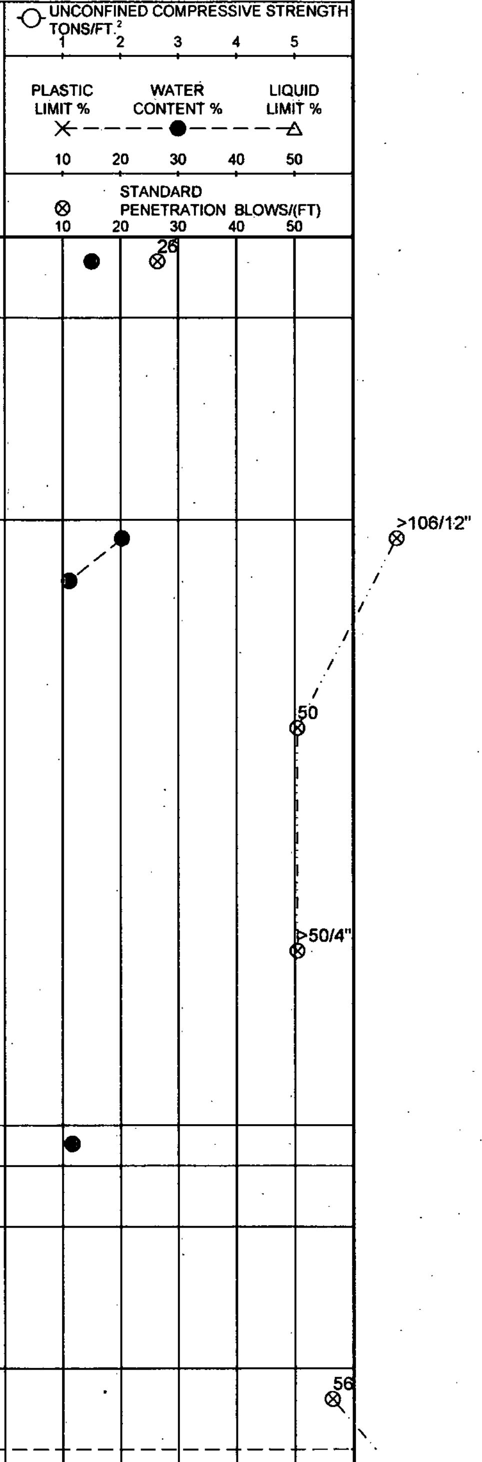
AECOM JOB NO. 60157757 SHEET NO. 1 OF 4

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR3** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,849.3 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | DESCRIPTION OF MATERIAL | STANDARD PENETRATION BLOWS/(FT) |
|---|---|---|---|---|
| | 7 | SS | Clayey GRAVEL with Sand (GC) - gravel to cobbles - subangular to subrounded 5" minus - very dense to medium dense - damp - brown | 26 |
| 32.0 | | PA | Well graded GRAVEL with Sand (GW) - subangular to subrounded gravel 3" minus - wet - brown | |
| 35.0 | 8 | SS | Many cobbles | |
| | | PA | | |
| 37.0 | 9 | SS | Well graded GRAVEL with Clay and Sand (GW-GC) - subangular gravel/cobbles/boulders - extremely dense to very dense - wet - brown | >106/12" |
| 40.0 | | PA | *NOTE: 4" clast of fine grain well graded SAND (SW) damp, dark red (maroon), cohesive. Possibly spent ore. | |
| | 10 | SS | Same from SPT without SW clast | 50 |
| 45.0 | | PA | Saturated | |
| | 11 | SS | Color change to red-brown with cobble/boulder | >50/4" |
| | | PA | | |
| 50.0 | 12 | SS | Many cobbles | |
| | | PA | | |
| 52.0 | 13 | SS | Well graded GRAVEL with Sand (GW) - subangular to subrounded gravel to cobbles - wet - red-brown | |
| 53.0 | | | Poorly graded SAND (SP) - medium grain - wet - red-brown - saturated | |
| 54.5 | | PA | Well graded GRAVEL with Sand, trace Silt (GW) - subrounded gravel - cobble 6" minus - wet - red-brown<br>Casing advanced with auger to 58.0' | |
| 58.0 | 14 | SS | Poorly graded very fine SAND (SP) - wet - red-brown - saturated<br>Grades to medium | 56 |
| 60.0 | | | | |



UNIT DRY WT. LBS./FT.³

. . . continued

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757 SHEET NO. 2 OF 4

**AECOM**

| | |
|---|---|
| CLIENT **Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR3** |
| PROJECT NAME **Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER **Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,849.3 Feet (Continued)

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE | | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|
| | | PA | | Poorly graded very fine SAND (SP) - wet - red-brown - saturated |
| | | | 61.5 | Grades to coarse sand/gravel subrounded-rounded 1" minus gravel . |
| | 15 | SS | 62.5 | Well graded SAND (SW), no fine sand, medium to coarse sand subrounded - very dense - wet - brown |
| | | | 63.0 | Well graded GRAVEL (GW) - subangular to subrounded - wet - brown - saturated |
| | | | 64.0 | Clayey GRAVEL with Sand (GC) - subangular to subrounded 1" minus - damp - brown with yellow mottling |
| 65.0 | | PA | | Poorly graded very fine SAND (SP) - wet - brown - saturated |
| | | | | Grades to medium then coarse sand/gravel |
| | 16 | SS | 67.5 | Grades fine to coarse in the SPT shoe |
| | | | 68.5 | Well graded SAND with Gravel (SW) - gravel could be broken cobble in shoe - very dense - wet - brown |
| | | | 69.5 | Poorly graded SAND (SP) - grades fine to coarse - wet - brown - saturated |
| 70.0 | | PA | 70.5 | Well graded GRAVEL with Sand, trace Silt (GW) - subrounded 1" minus gravel - wet - brown |
| | | | | Poorly graded SAND (SP) - grades fine to coarse to gravel - dense - wet - brown |
| | 17 | SS | 73.0 | Well graded SAND with Gravel (SW) - rounded 2" minus - wet - brown with yellow mottling |
| | | | 74.0 | Poorly graded SAND (SP) - grades medium to coarse to with gravel rounded 0.5" minus - wet - brown |
| 75.0 | | PA | 75.5 | Well graded GRAVEL with Sand, trace Silt (GW) - subrounded to rounded 1" minus gravel - wet brown |
| | 18 | SS | 77.0 | Well graded SAND with Gravel, trace Silt (SW) - rounded 1 " minus - wet - brown - dense - saturated |
| 80.0 | | PA | 80.0 | Well graded SAND (SP) - medium grain - wet - brown |
| | 19 | SS | 82.0 | Well graded GRAVEL with Sand (GW), trace fines - subrounded to rounded gravel - grades 0.5" minus to 2" minus gravel - dense - wet - brown |
| 85.0 | | PA | 84.0 | Well graded SAND with Gravel (SW) - subrounded to rounded gravel .5" minus - wet - brown |
| | 20 | SS | 86.0 | Well graded SAND with Silt and Gravel (SW-SM) - subrounded gravel 2" minus - wet - brown |
| 90.0 | | | | |

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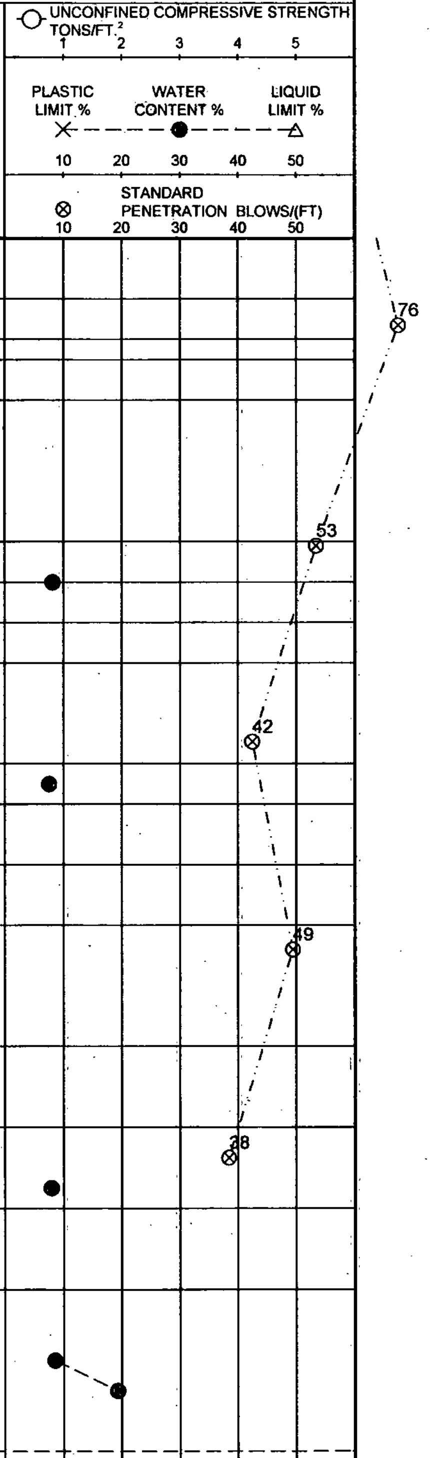

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 3 OF 4

**AECOM**

| | |
|---|---|
| CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR3** |
| PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |
| SITE LOCATION | |

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$: 1 2 3 4 5

PLASTIC LIMIT % × — WATER CONTENT % ● — LIQUID LIMIT % △: 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

SURFACE ELEVATION +8,849.3 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ | PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % |
|---|---|---|---|---|---|---|---|---|
| | | | PA | | | 90.5 Poorly graded fine SAND (SP) - wet - tan-brown | | |
| | | 21 | SS | | | | | ● |
| 95.0 | | | PA | | | 94.0 Poorly graded very fine SAND with Silt (SP-SM) - wet - brown<br>*NOTE: Includes 3" layers of poorly graded very fine sand with clay (SP-SC) | | |
| | | 22 | SS | | | 97.0 Poorly graded very fine SAND, trace Silt (SP) - wet - brown | | |
| 100.0 | | | PA | | | Gravel-cobbles 4" minus - subangular to subrounded<br>100.0 | | |
| | | | | | | End of Boring<br>Boring logged by: S. Johnston<br>Casing: 7.0" I.D. | | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388867 | BORING STARTED 10/10/11 | AECOM OFFICE Denver | |
| EASTING 2268034 | BORING COMPLETED 10/13/11 | ENTERED BY SJH | SHEET NO. 4 OF 4 |
| WL 32.0' WD | RIG/FOREMAN SONIC C600/ | APP'D BY EED | AECOM JOB NO. 60157757 |

**AECOM**

| | |
|---|---|
| CLIENT | **Atlantic Richfield Company** |
| PROJECT NAME | **Rico-Argentine Site - OU01** |
| LOG OF BORING NUMBER | **SSR4** |
| ARCHITECT-ENGINEER | **Drilling Company: Boart Longyear** |
| SITE LOCATION | |

SURFACE ELEVATION +8,839.5 Feet

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|
| | | | GB | | | PDF EMBANKMENT FILL (GW) - Not logged | |
| 4.0 | | | | | | FILL - Calcines (SM-SP) - sand and silt sized - medium dense to loose | |
| 5.0 | | 1 | GB | | | | |
| | | | GB | | | | |
| 10.0 | | 2 | GB | | | | |
| | | | GB | | | | |
| 15.0 | | 3 | GB | | | | |
| | | | GB | | | | |
| 20.0 | | 4 | GB | | | | |
| | | | GB | | | | |
| 25.0 | | 5 | GB | | | ALLUVIUM - Silty Sandy Cobbly GRAVEL (GW) - subrounded to subangular - cobbles to 3.0" - less than approximately 5-10% silt - very dark gray 7.5YR 3/1 - extremely dense to dense<br>25.0-30.0' - Significant sample loss - log/depth approximate - no sample taken<br>Sample 5: Recorded as "51/Driller recalls "refusal"" | |
| | | | GB | | | | |
| 30.0 | | | | | | | |

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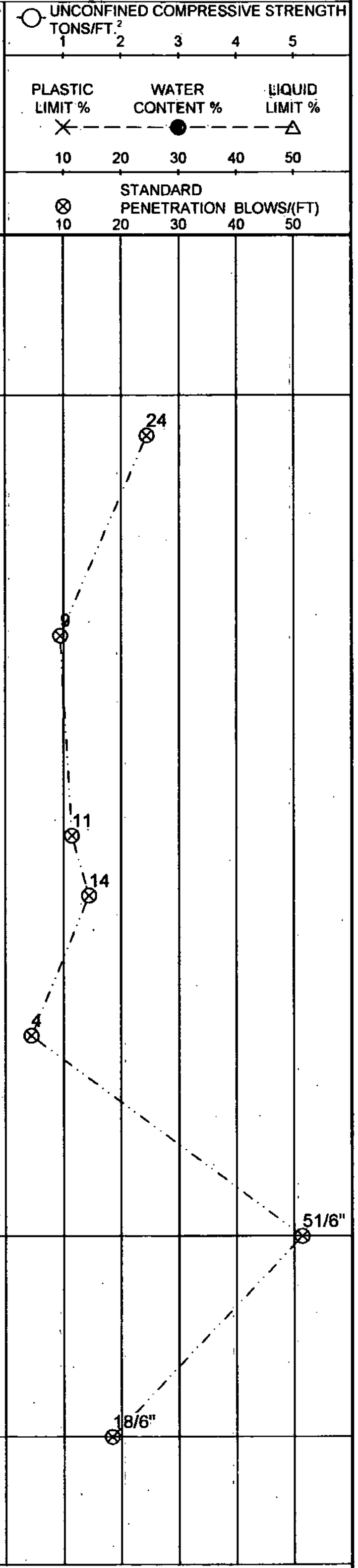


The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

SHEET NO. 1 OF 3

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR4** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$
1 2 3 4 5

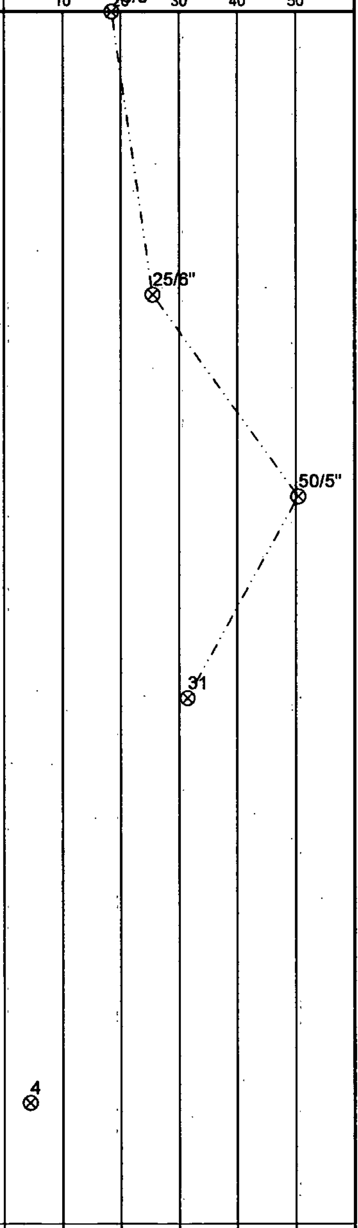
PLASTIC LIMIT % ✕ — WATER CONTENT % ● — LIQUID LIMIT % △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/(FT)
10 20 30 40 50

UNIT DRY WT. LBS./FT.$^3$

SURFACE ELEVATION +8,839.5 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL |
|---|---|---|---|---|---|---|
| | | 6 | GB | | | ALLUVIUM - Silty Sandy Cobbly GRAVEL (GW) - subrounded to subangular - cobbles to 3.0" - less than approximately 5-10% silt - very dark gray 7.5YR 3/1 - dense and extremely dense above 50.0'<br>Becoming dark brown 7.5YR 3/4 with cobbles to 4.0" at 30.0'<br>Sample 6: Recorded as "18/Driller recalls "refusal"" |
| 35.0 | | | GB | | | |
| | | | | | | Becomes strong brown 7.5YR 4/6<br>Sample 7: Recorded as "25/Driller recalls "refusal"" |
| | | 7 | GB | | ▼ | |
| 40.0 | | | GB | | | Becomes yellowish brown 10YR 4/6 - wet (Approximate depth) |
| | | 8 | GB | | | |
| 45.0 | | | GB | | | |
| | | 9 | GB | | | Significant reduction in max gravel size to 1.0" - well graded - predom. subrounded with subangular - yellowish red 5YR 4/6 - wet |
| 50.0 | | | GB | | | |
| | | 10 | GB | | | ALLUVIUM - Gravelly SAND (SW) - subangular to well rounded gravels - weak red 2.5YR 4/2 - wet<br>Driller reports 5.0' heave, cleanout then 5.0' heave (attempting clean out using flapper bit, driller report 3.0' heave) Skipping to 57.0'<br>Sample 10: Driller lost sample on surface - reports "all same stuff" |
| 55.0 | | | GB | | | |
| | | 11 | GB | | | Loose condition may be due to blow-in from ground water |
| | | | GB | | | |
| 60.0 | | | | | | 60.0 |



. . . continued

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. 60157757

| | | |
|---|---|---|
| AECOM | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR4** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL<br>SURFACE ELEVATION +8,839.5 Feet (Continued) | UNIT DRY WT. LBS./FT.$^3$ | ○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT.$^2$ 1 2 3 4 5<br>PLASTIC LIMIT % ✕ WATER CONTENT % ● LIQUID LIMIT % △ 10 20 30 40 50<br>⊗ STANDARD PENETRATION BLOWS/(FT) 10 20 30 40 50 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | End of Boring<br>Boring logged by: R. Anderson (0.0-42.0')/Interpreted by A. Jewell, A. Jewell (42.0-60.0')<br>Casing: 5.5" I.D. | | |

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388644 | BORING STARTED 10/13/11 | AECOM OFFICE Denver | |
| EASTING 2268005 | BORING COMPLETED 10/13/11 | ENTERED BY SJH | SHEET NO. 3 OF 3 |
| WL 38.0' WD Estimated | RIG/FOREMAN PROSONIC 800T/ | APP'D BY EED | AECOM JOB NO. 60157757 |

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR5** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,832.3 Feet

| DEPTH(FT) | SAMPLE NO. | SAMPLE TYPE |
|---|---|---|
| 0.0–4.0 | | GB |
| 5.0 | 1 | GB |
| | | GB |
| 10.0 | 2 | GB |
| | 3 | ST |
| | | GB |
| 15.0 | 4 | GB |
| | | GB |
| 20.0 | 5 | GB |
| | | GB |
| 25.0 | 6 | GB |
| | | GB |
| 30.0 | 7 | GB |
| 35.0 | | GB |

DESCRIPTION OF MATERIAL

PDF EMBANKMENT FILL - Silty Sandy GRAVEL (GW) - approximately 60% gravel to 2.0" or larger, 30% sand and 10% silt fines - predom. subrounded, also subangular to well rounded - brown 7.5YR 4/4 - moist

4.0

FILL - Wasterock - Clayey Sandy GRAVEL (GC) - chunks of highly altered rock forming residual clayey sands - approximately 40 % gravel, 35% sand and 25% clay - well rounded to subangular gravels to 2.0" or larger - various colors, dark reddish brown 2.5YR 3/4, very dark grayish brown 10YR 3/2 and yellowish brown 10YR 5/8 - moist

5.0

8.0

FILL - Process waste? and manmade debris (cables) - Clayey Gravelly SAND (SM) - approximately 50 % sand, 30% low plastic clay and 20% gravel - subangular to subrounded gravel to 2.0" or larger - reddish black 10YR 2.5/1 - medium dense - moist

FILL - Calcines - fine sand and silt sized (SM) - reddish purple to purplish black (no munsell) - moist - loose to very loose

11.5-13.5' - Attempted shelby tube - no recovery

Becoming wet

Higher silt content from 15.0-17.5'

Lower silt content, wet and coarser sand sized from 18.0-20.0'

25.5

COLLUVIUM/POSSIBLE WASTEROCK - Clayey Sandy Cobbly GRAVEL (GC) - approximately 40% gravel, 35 % sand and 25% clay - cobbles to 5.0" or larger - predom. subangular to angular - fragments predom. greenstone - clay moderately plastic - very dark gray 7.5YR 3/1 - extremely dense - moist

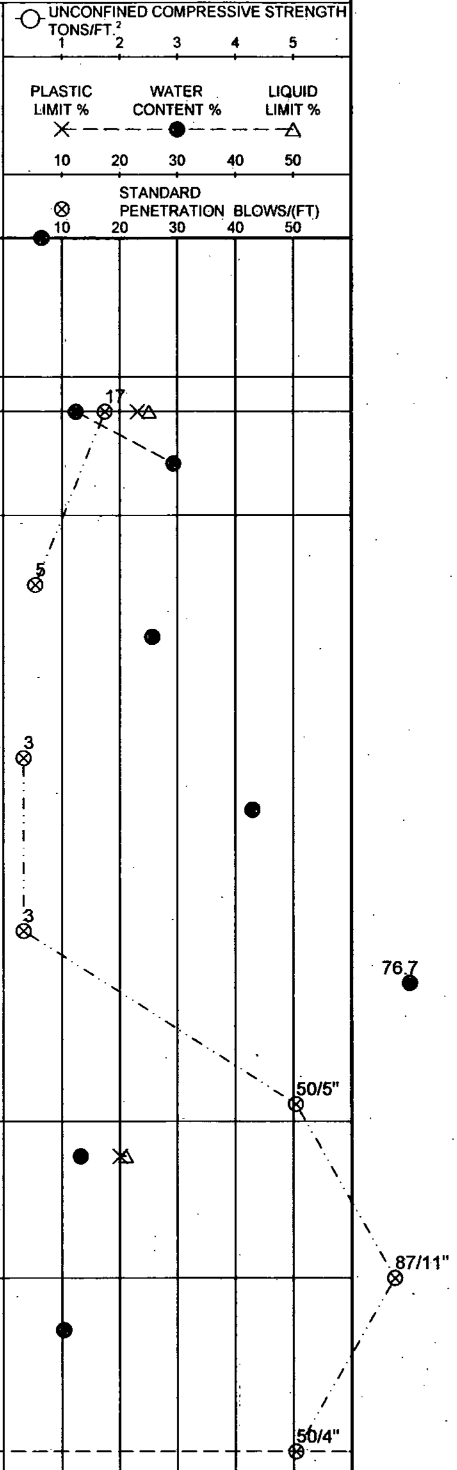
30.0

29.5' - Becomes wet - clay fines approx. 15% (GW-GC)

POSSIBLE ALLUVIUM - Clayey Sandy Cobbly GRAVEL (GC) - approximately 40% gravel, 35 % sand and 25% clay - cobbles to 5.0" or larger - predom. subangular to angular - fragments predom. greenstone - clay moderately plastic - very dark gray 7.5YR 3/1 - extremely dense - moist

Becomes dark brown 7.5YR 3/2 at 30.0'

. . . continued



UNIT DRY WT. LBS./FT.³

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

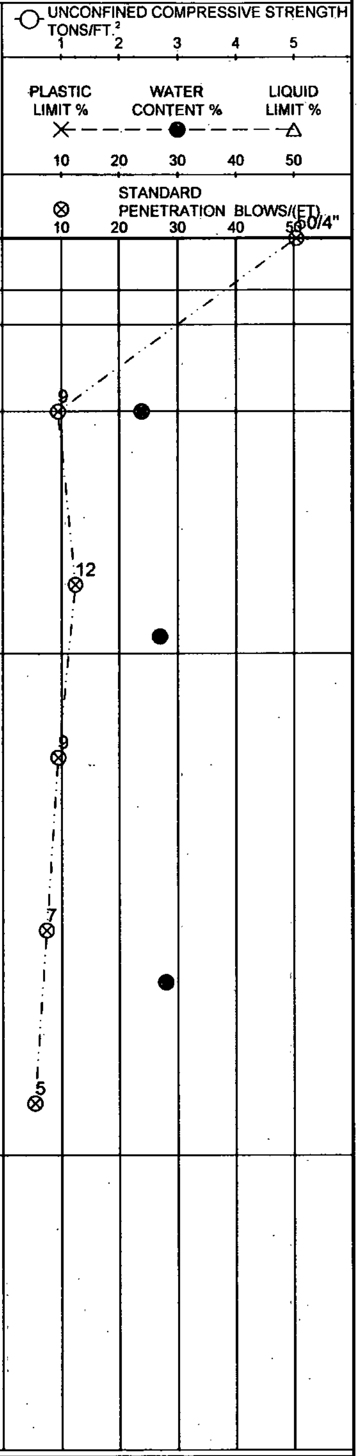
AECOM JOB NO. 60157757 | SHEET NO. 1 OF 2

| | | |
|---|---|---|
| **AECOM** | CLIENT<br>**Atlantic Richfield Company** | LOG OF BORING NUMBER **SSR5** |
| | PROJECT NAME<br>**Rico-Argentine Site - OU01** | ARCHITECT-ENGINEER<br>**Drilling Company: Boart Longyear** |

SITE LOCATION

SURFACE ELEVATION +8,832.3 Feet (Continued)

| DEPTH(FT) | ELEVATION(FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | Strata depth | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS./FT.$^3$ |
|---|---|---|---|---|---|---|---|---|
| | | 8 | GB | | | 36.5 | 34.0' - Becomes dark yellowish brown 10YR 3/4 - silt fines approx. 15% (GM) | |
| | | | | | | 37.5 | ALLUVIUM - Silty fine SAND with Gravel (SM) - gap graded - dark yellowish brown 10YR 4/6 - moist | |
| | | | GB | | | 40.0 | ALLUVIUM - Silty Sandy GRAVEL (GM) - approximately 50% gravel to 2.0" or larger, 35% sand and 15% silt fines - well graded - subrounded to angular - dark yellowish brown 10YR 4/6 - loose - wet | |
| 40.0 | | 9 | GB | | | | Silty SAND (SP) - silt <5% - well graded - scattered gravel to 1.5" - gravel content approx. <5% - predom fine to medium grained sand with subrounded coarse grains - dark yellowish brown 10YR 3/6 - loose to medium dense<br>Dark brown from 40.5-42.0' | |
| | | | GB | | | | | |
| 45.0 | | 10 | GB | | | 47.0 | Gravel content decreases substantially | |
| | | | GB | | | | Fine SAND (SP) - silt <5% - weak red 2.5YR 4/2 - loose - wet<br>Driller reports 4.0' heave - pushing casing and cleaning out with flapper bit - may account for lower N values | |
| 50.0 | | 11 | GB | | | | | |
| | | | GB | | | | Includes 10-15% silt fines from 52.0-54.0' (SM) | |
| 55.0 | | 12 | GB | | | | Silt content increasing slightly (SP) | |
| | | | GB | | | | | |
| 60.0 | | 13 | GB | | | | | |
| 61.5 | | | | | | 61.5 | End of Boring<br>Boring logged by: A. Jewell<br>Casing: 5.5" I.D. | |



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

| | | | |
|---|---|---|---|
| NORTHING 1388408 | BORING STARTED 10/12/11 | AECOM OFFICE Denver | |
| EASTING 2268067 | BORING COMPLETED 10/13/11 | ENTERED BY SJH | SHEET NO. 2 OF 2 |
| WL 15.5' WD | RIG/FOREMAN MINI-SONIC C100/D. Cerventes | APP'D BY EED | AECOM JOB NO. 60157757 |

# 2011 Test Pit Logs

# TEST PIT LOG

TEST PIT #: TP2001 - 1

PROJECT: Rico St. Louis Ponds

NO:

DATE: 21 SEP 11

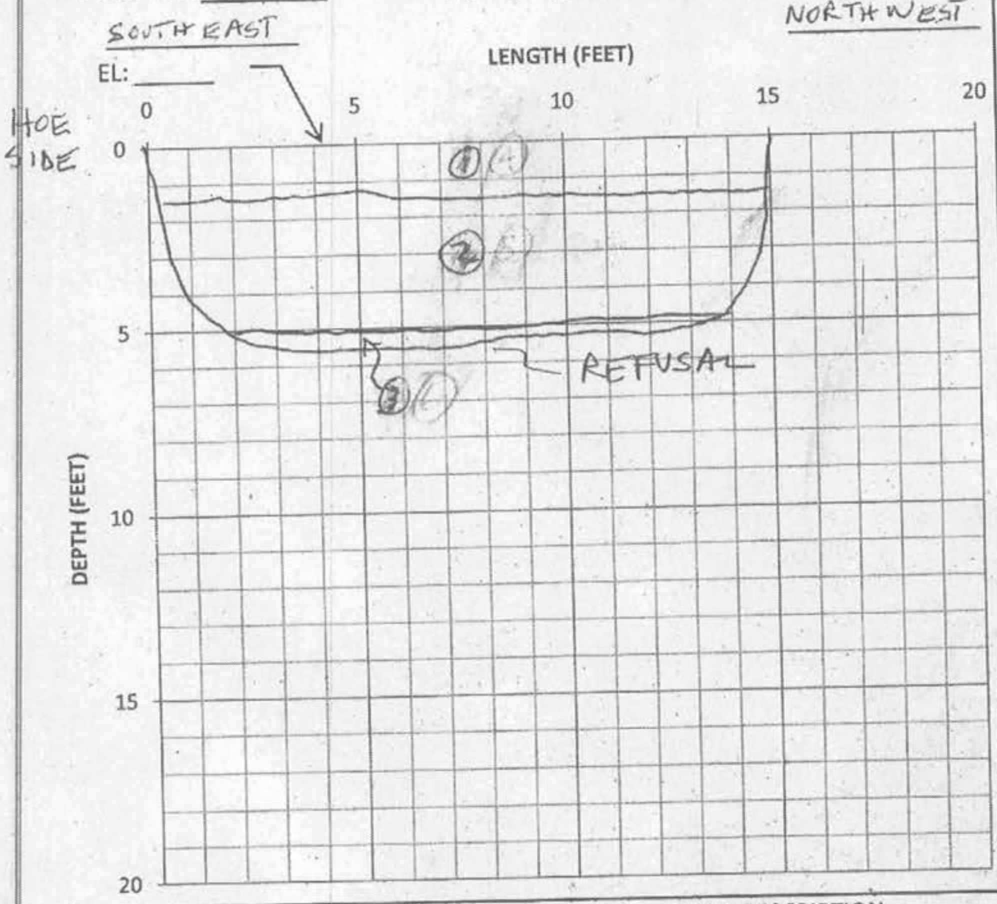
LOGGED BY: ACJ

WEATHER: SUNNY 65° F

EXCAVATION METHOD: CAT 330 C LONG STICK

LOCATION: POND 13 POND PERIMETER, IN POND, NEAR SE CORNER

Start Time: 1:10 PM End Time: 1:25 PM Note:



NOTES/SAMPLES

1 1 GAL BAG MAT ① 0-1.5'

1 1 GAL BAG, MAT ② 1.5-5'

2 5 GAL BUCKETS MAT ③ 5'-6' 3"- ONLY

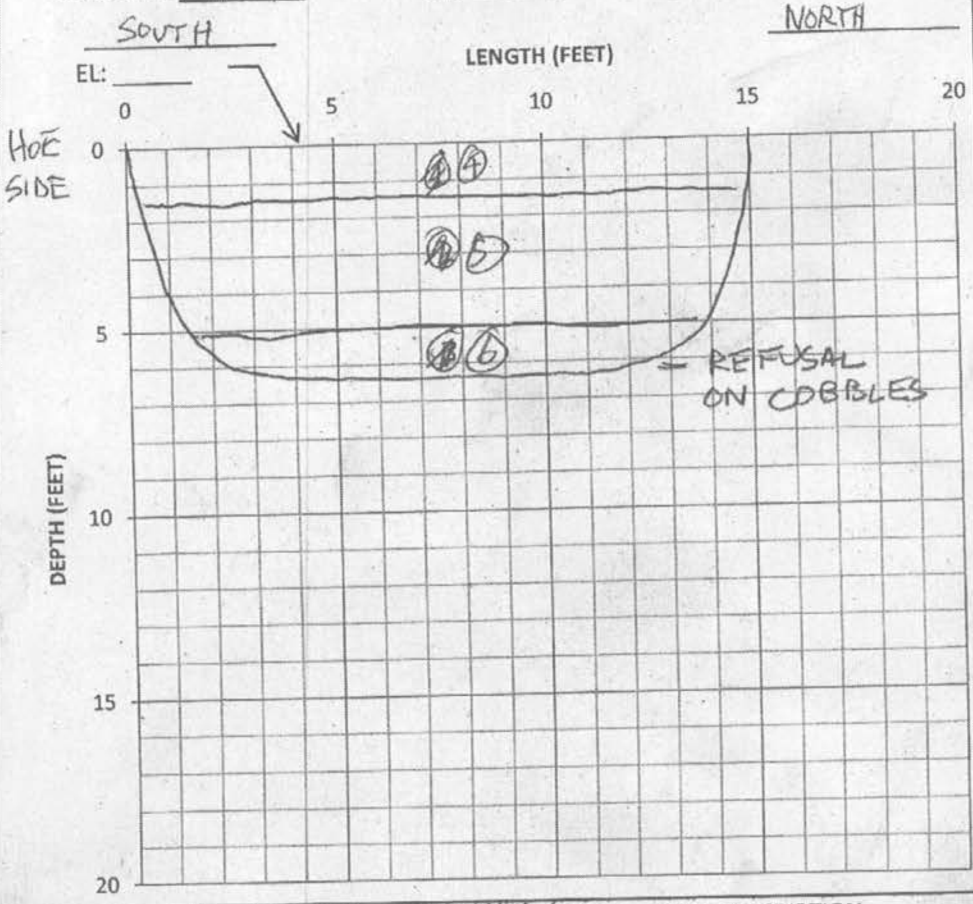
| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① | PRECIPITATED SOLIDS, MIXED W/ OTHER SOIL, 5YR 5/3 DARK REDDISH BROWN, SANDY SILT W/ SCATTERED GRAVEL UP TO ½" LOW PLASTICITY, SAND MOSTLY FINE, SOLIDS IN SOME CASES FORM V. SOFT SAND-SIZED PARTICLES, V. SOFT |
| ② | CALCINES, SILTY SAND, WET, NO MUNSELL COLOR AVAIL - DARK REDDISH PURPLE, NON-PLAST, TENDS TO LIQUEFY AND FLOW WHEN DISTURBED IN PIT, WHEN SATURATED THEN SET HARD AS WATER RELEASED, V. LOOSE |
| ③ | CLAYEY, SANDY GRAVEL W/ COBBLES AND BOULDERS TO 12" EST. 10-15% COBBLES AND BOULDERS, 3/10GY, DARK GREENISH GRAY, ANGULAR TO SUBROUNDED, GRAVEL AND COBBLES GOOD HARD TO V. HARD |

# TEST PIT LOG

|  |  |
|---|---|
| PROJECT: Rico St. Louis Ponds | DATE: 21 SEP 11 |
| NO: | LOGGED BY: ACJ |
| WEATHER: SUNNY 65° | EXCAVATION METHOD: CAT 330 C CONF |
| LOCATION: POND 13, IN POND NEAR DECANT, SOUTHWEST CORNER | |

TEST PIT #: TP2011-2

Start Time: 1:25 AM End Time: 2:10 PM Note:



## NOTES/SAMPLES

1 GAL BAG SAMPLE ④, 0-1.5'

1 GAL BAG SAMP. ⑤ 1.5'-5.0'

2 5GAL BUCKETS MATL ⑥ 5-6'

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ④ | PRECIPITATED SOLIDS, MIXED WITH OTHER SOIL, MOIST, 5YR 3/3 DARK REDDISH BROWN, SANDY SILT W/ SCATTERED GRAVEL UP TO ½", LOW PLASTICITY, SAND MOSTLY FINE, SCATTERED MED AND COARSE. V. SOFT. |
| ⑤ | CALCINES, SILTY SAND ~~SANDY SILTS~~, WET, NO MUNSELL COLOR AVAILABLE DARK REDDISH PURPLE, & NON-PLASTIC, TEND TO LIQUEFY AND FLOW WHEN DISTURBED IN PIT WHEN SATURATED, THEN SET HARD. V. LOOSE. |
| ⑥ | SANDY SILT W/ SCATTERED GRAVEL UP TO ¼", WET, 3/10BG DARK GREENISH GRAY, LOW PLASTICITY, GRAVEL ANGULAR. |

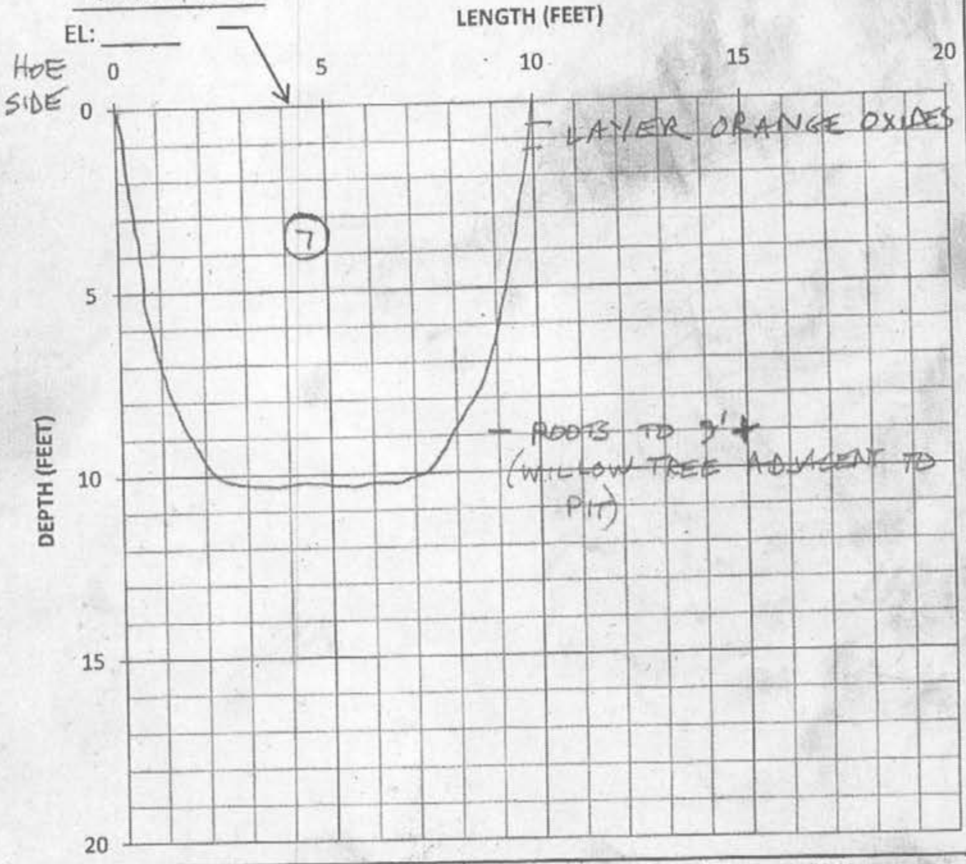
# TEST PIT LOG

| | | |
|---|---|---|
| PROJECT: Rico St. Louis Ponds | DATE: 21 SEP 11 | TEST PIT #<br>TP 2011-3 |
| NO: | LOGGED BY: ACJ | |

WEATHER: SUNNY, 65°
EXCAVATION METHOD: CAT 308C CR MINI EX
LOCATION: SOUTHWEST CORNER, POND 11, ALONG EMBANKMENT FLOOD DIKE

Start Time: 2:17 PM
End Time: 3:00 PM
Note:

NORTHWEST
SOUTHEAST
EL:
HOE SIDE



## NOTES/SAMPLES

⑦ 3 5 GAL BUCKETS
0-10'
3"- ONLY

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ⑦ | EMBANKMENT FILL, CLAYEY, COBBLY SANDY GRAVEL, SL. MOIST, 7.5 YR 3/2 (DARK BROWN), BOULDERS TO 14", ~3% BOULDERS, ~10% COBBLES, ~40% GRAV, ~30% SAND, SUB-ANGULAR TO ROUNDED, GRAVEL + COBBLES MOD HARD - V. HARD, |

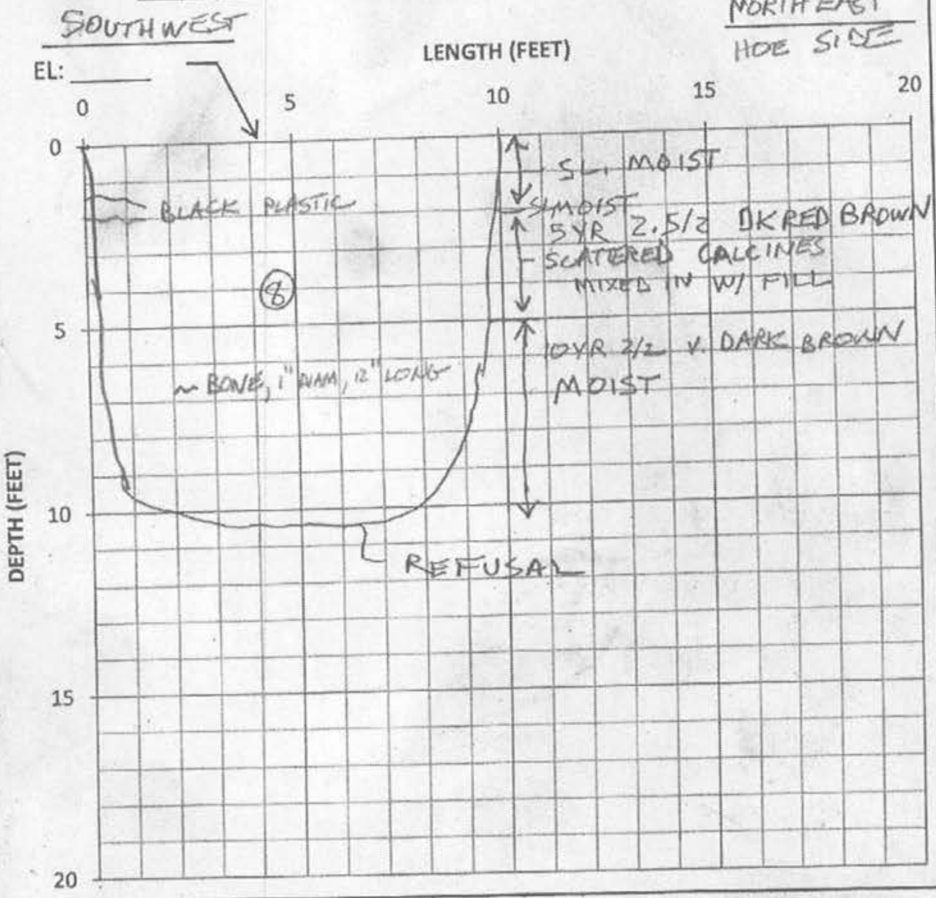
## TEST PIT LOG

TEST PIT #: TP2011-4

PROJECT: Rico St. Louis Ponds
NO:
DATE: 21 SEP 11
LOGGED BY: ACJ

WEATHER: SUNNY, 65°
EXCAVATION METHOD: CAT 308C CR MINI EX
LOCATION: POND 13 DIKE, NEAR MIDDLE

Start Time: 3:05 PM End Time: 3:45 PM Note:



### NOTES/SAMPLES

NUMEROUS LARGE ROCKS
SLOW DIGGING
2' - 8'

OPERATOR REPORTS
V. HARD DIGGING 8'

3 5 GALLON
BUCKETS MATL
⑧, -3" (APPROX)
ONLY 0'-10'

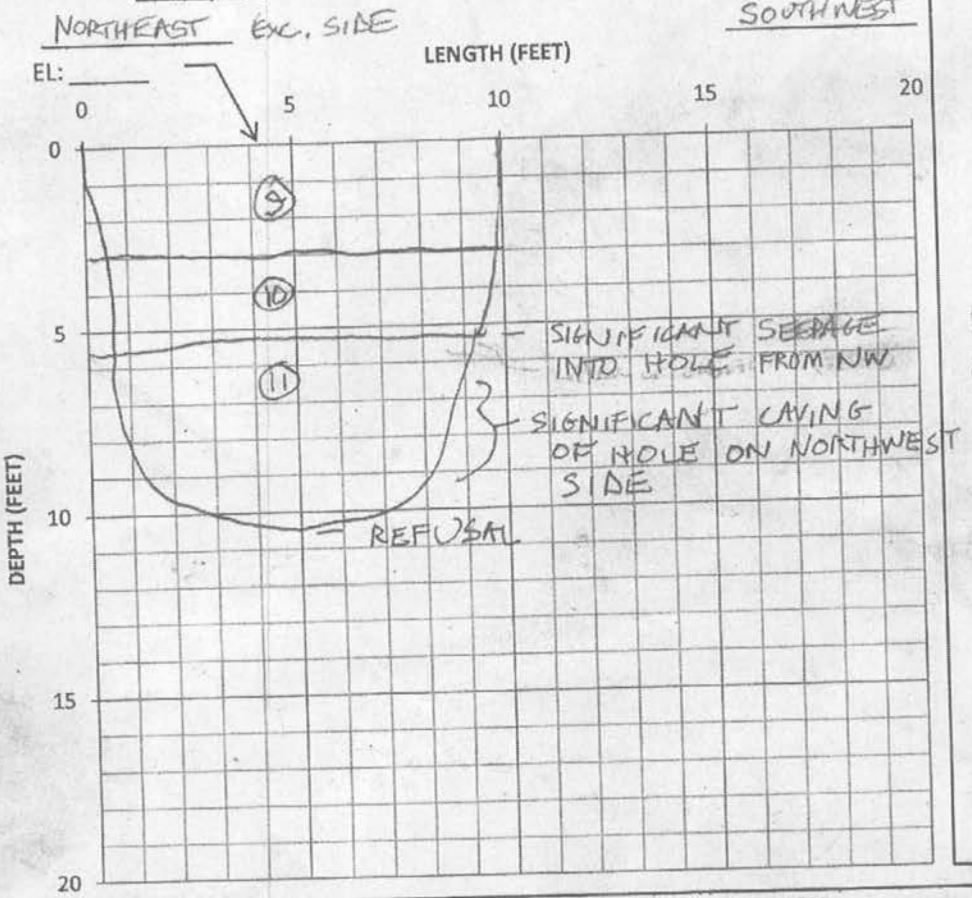
| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ⑧ | EMBANKMENT FILL, SEE ABOVE FOR MOISTURE AND COLOR, BOULDERS TO 18", SUB ANGULAR TO ROUNDED, ~3% BOULDERS, ~5-10% COBBLES, ~40% GRAVEL, ~30% SAND. GRAVEL AND COBBLES MOD HARD - V. HARD. |

# TEST PIT LOG

TEST PIT #: TP2011 - 5

PROJECT: Rico St. Louis Ponds
NO:
DATE: 21 SEP 11
LOGGED BY: ACJ
WEATHER: 65° SUNNY
EXCAVATION METHOD: CAT308C CR MINI EX
LOCATION: POND 7 EAST ABUTMENT, JUST EAST OF OVER FLOW STRUCTURE

Start Time: 3:55 PM End Time: 4:40 PM Note:



NOTES/SAMPLES

1 5 GAL BUCKET MATERIAL ⑩ 3'-5'

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ⑧<br>⑨ | FILL, CLAYEY, COBBLY SANDY GRAVEL, MOIST, 7.5 YR 3/2 DARK BROWN, SUB-ANGULAR TO ROUNDED, ~2% BOULDERS, 5% COBBLES TO 12", COBBLES, 35% GRAVEL, 30% SAND. GRAVEL AND COBBLES MOD HARD-HARD |
| ⑩ | ALLUVIUM ORGANIC SILTY SAND, NON-PLASTIC, MOIST, GLEY 2/2.5/1 BLUISH BLACK, NUMEROUS DECAYED ROOTS, ORGANIC SMELL, SOFT. |
| ⑪ | ALLUVIUM, WELL GRADED SANDY GRAVEL, WET, 10 YR 3/1 (VERY DARK GREY), STRATIFIED, BOULDERS TO 24", ROUNDED TO SUBANGULAR (PREDOM. ROUNDED), ~10% BOULDERS, ~40% COBBLES, ~35% GRAVEL, ~15% SAND. GRAVEL + COBBLES MOD HARD TO V. HARD |

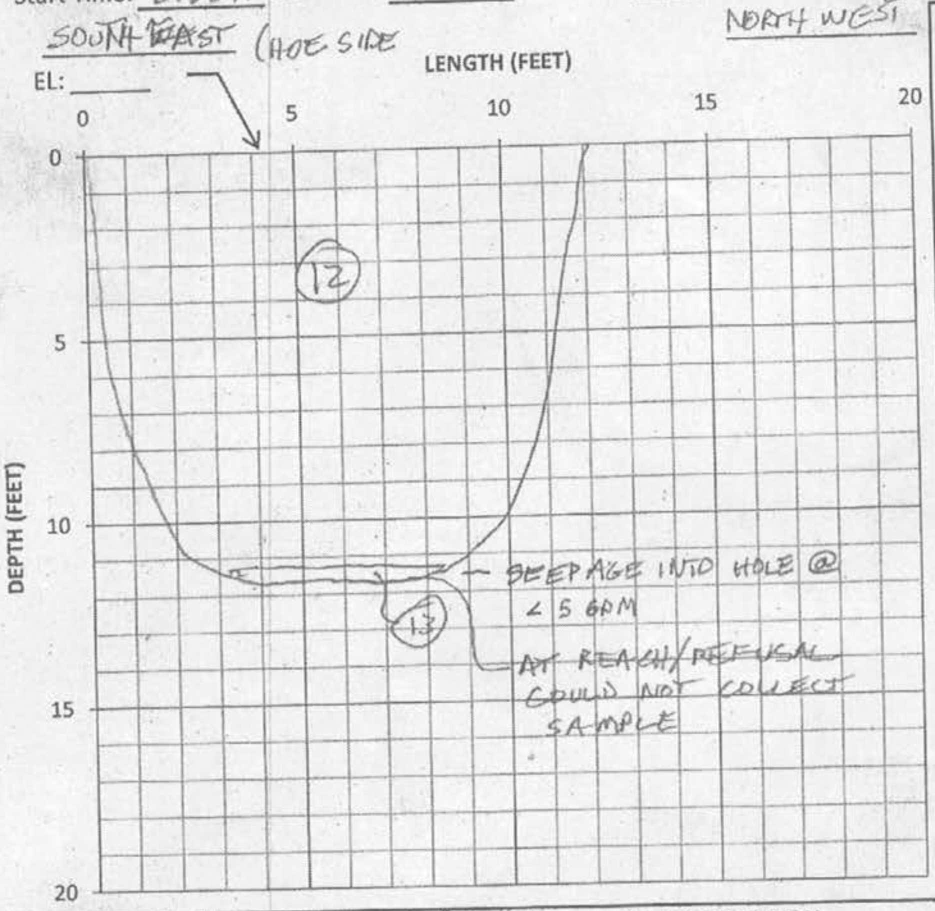
# TEST PIT LOG

TEST PIT #: TP2011-6

PROJECT: Rico St. Louis Ponds
NO:
DATE: 22SEP 11
LOGGED BY: ACJ

WEATHER: 32° SUNNY WEST
EXCAVATION METHOD:
LOCATION: SOUTH ~~EAST~~ CORNER POND 18 ON DIKE (BOUNDARY BETWEEN FLOOD DIKE AND POND 18 DAM

Start Time: 8:20 AM End Time: 9:00 AM Note:



NOTES/SAMPLES

2 5 GAL BUCKETS MAT ⑫ 0-11'

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ~~⑪~~ ⑫ | EMBANKMENT FILL, CLAYEY SANDY GRAVEL / GRAVELLY SAND WITH ~~COBBLES~~ BOULDERS UP TO 18", MOIST, 5YR 2.5/1 BLACK, GRAVEL AND COBBLES PRIMARILY SUB ANGULAR TO ANGULAR, < 1% BOULDERS ~5% COBBLES, ~30% GRAV, ~30% SAND, ~30% FINES, COBBLES + GRAV. MOD HARD TO HARD. |
| ⑬ | ALLUVIUM, SANDY GRAVEL W/ COBBLES TO 6", COLOR SIMILAR TO ABOVE + INFLUENCED BY, WET, SUBROUNDED TO SUB ANGULAR, ~50% COBBLES, 35% GRAVEL, MOD HARD TO HARD PARTICLES |

# TEST PIT LOG

TEST PIT #: TP 2011-7

DATE: 22 SEP 11

PROJECT: Rico St. Louis Ponds

LOGGED BY: ACJ

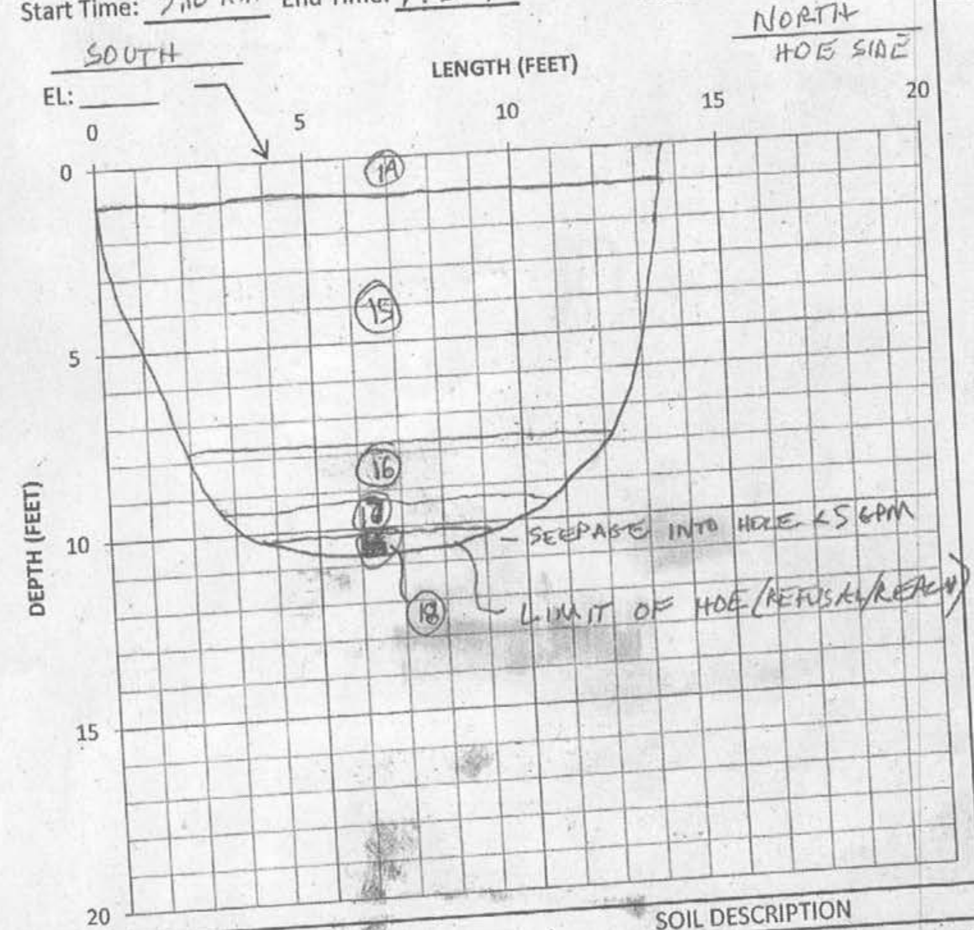
NO:

EXCAVATION METHOD:

WEATHER: 40° SUNNY

LOCATION: POND 18, ALONG FLOOD DIKE, NEAR N. END POND

Start Time: 9:10 AM End Time: 9:50 AM Note:



NOTES/SAMPLES

2 5 GAL BUCKETS MATL ⑯ 8-9.5

1 1 GAL BAG MATL ⑰ 9.5-10

VISITORS:
STEVE WAY
C. SANCHEZ

SOIL DESCRIPTION

| SOIL TYPE | |
|---|---|
| ①⑭ | EMBANKMENT RAISE, SANDY GRAVEL, SL. MOIST, 10YR 3/6 DARK YELLOWISH BROWN, GRAVEL UP TO 3/4", ~EQUAL SAND + GRAVEL, WELL GRADED, HARD TO V. HARD PARTICLES, IMPORTED MATERIAL |
| ⑮ | MOIST EMBANKMENT FILL, SAME AS MATL 12, TP 2011-6. |
| ⑯ | EMBANKMENT FILL, SIMILAR TO MAT ⑮, EXCEPT MORE FINES (CLAY) ~40% FINES, COBBLES + GRAVELL TEND TO BE MORE ROUNDED |
| ⑰ | ~~SILTY SAND~~/SANDY SILT ALLUVIUM, LOW PLASTICITY, WET, BLUISH BLACK, GLEY 2 2./1 PORTABLE CONE PEN: 10 MM: 0.3 kg, 20 MM 0.8 kg, |
| ⑱ | ALLUVIUM, SIMILAR TO MAT. ⑬, TP 2011-6. |

## TEST PIT LOG

**TEST PIT #** TP2011-8

**PROJECT:** Rico St. Louis Ponds
**DATE:** 22 SEP 11
**NO:**
**LOGGED BY:** ACJ

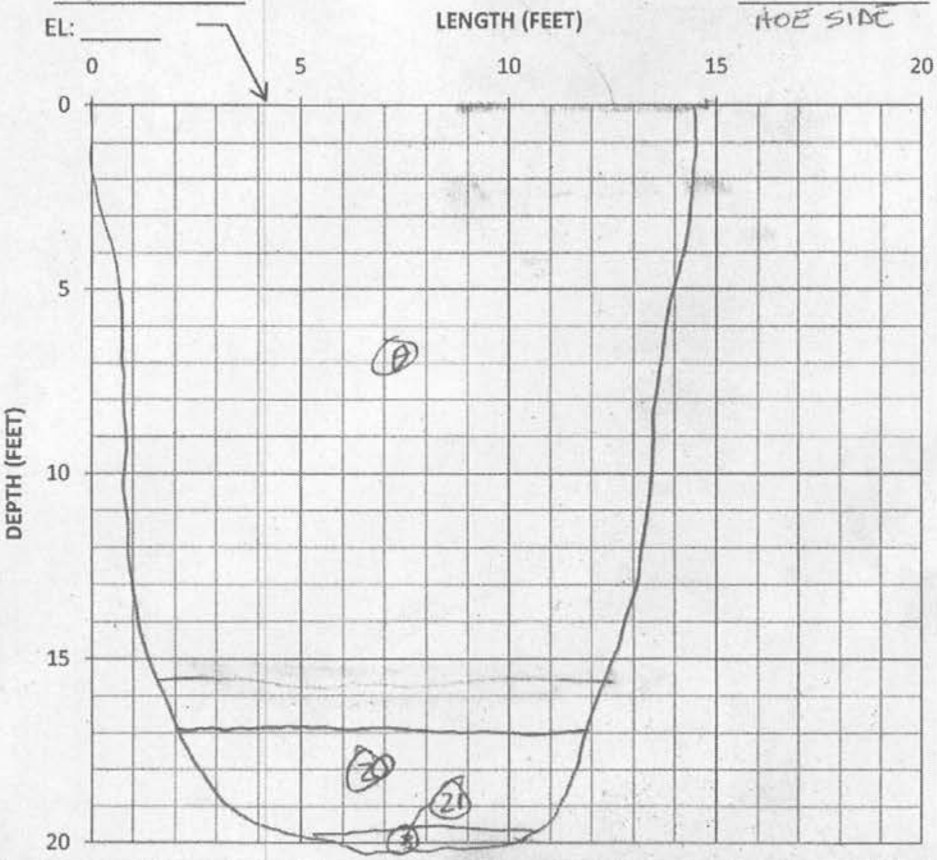
**WEATHER:** SUNNY, 60°F
**EXCAVATION METHOD:**
**LOCATION:** POND 16/17 DIKE

**Start Time:** 10:15 AM **End Time:** **Note:**

EAST

WEST
HOE SIDE

EL:



**NOTES/SAMPLES**

2 5 GAL BUCKETS
0'–17'
-3" ONLY MAT ⑲

1 1 GAL BAG
17–19.5'
MAT ⑳

| SOIL TYPE | SOIL DESCRIPTION ~ OXIDIZED |
|---|---|
| ①19 | EMBANKMENT FILL, LENSES OF WASTE ROCK, SANDY GRAVEL/GRAVELLY SAND W/ CLAY AND BOULDERS TO 15", LENSES OF CALCINE, VISIBLE STRATIFICATION, OVERALL COLOR 5YR 3/2 DARK REDDISH BROWN, SUB ANGULAR TO ANGULAR, ~3% BOULDERS 10% COBBLES, 30% GRAV., 35% SAND, ~20% FINES (SILT W/ SOME CLAY) MOST GRAVEL + COBBLES MOD HARD TO HARD W/ EXCEPTION OF OXIDIZED WASTROCK, WHICH BREAKS EASILY (SOFT). |
| ⑳ | WASTE ROCK OR ALLUVIUM (PROBABLE), MOIST, NUMEROUS LIVE AND DEAD ROOTS, UP TO 3/8" IN DIAM., LENSES OF HIGHLY WEATHERED ROCK (SEE PHOTO, (SILTY CLAY), POCK PEN: 2.4 kg 20 MM TIP, 1.2 10 MM TIP., MOD TO HIGH PLASTICITY |
| 21 ③ – | ALLUVIUM?, SILTY SAND, MOIST, V. SIMILAR TO MAT ⑰, TP 2011-7, |

ROOTS TO 3/8"

## TEST PIT LOG

**TEST PIT #** TP 2011-9

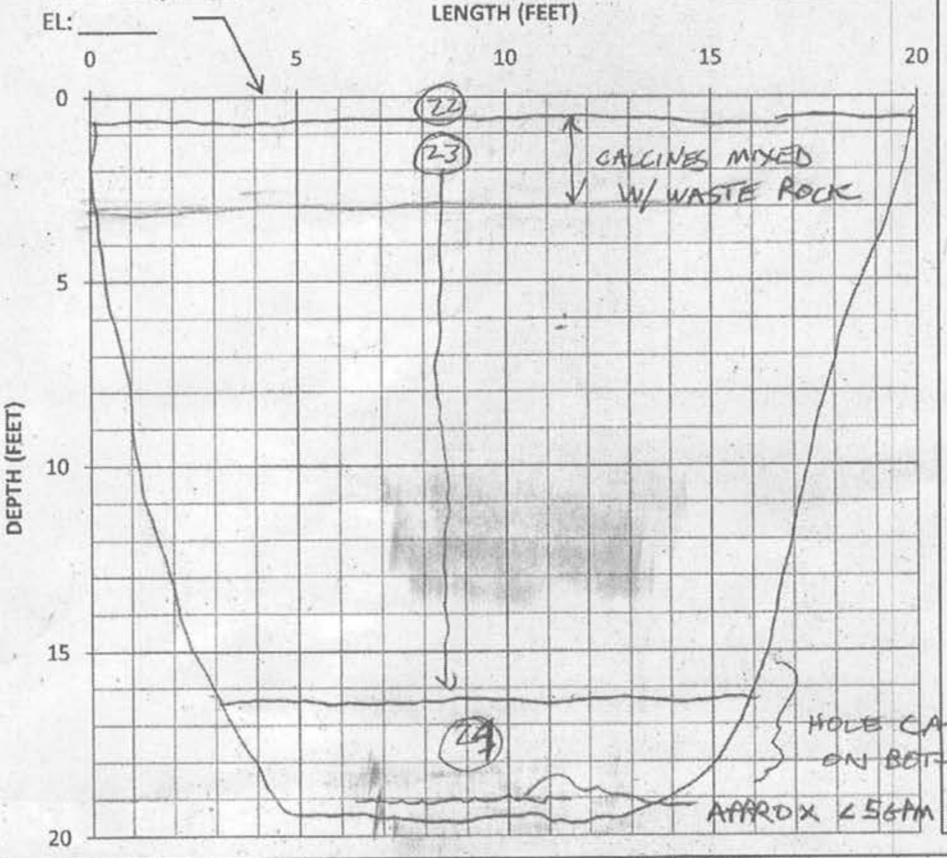
PROJECT: Rico St. Louis Ponds
NO:
DATE: 22 SEP 11
LOGGED BY: ACJ

WEATHER: 65°F SUNNY
EXCAVATION METHOD: CAT 330C
LOCATION: POND 18, EAST SIDE, IN BANK N. OF RAW

Start Time: 11:30 AM End Time: 12:15 PM Note:

SOUTH (EXC. SIDE) NORTH

EL:



**NOTES/SAMPLES**

UNITS ㉓ AND ㉔ TOO COARSE FOR REPRESENTATIVE

| SOIL TYPE | FILL SOIL DESCRIPTION |
|---|---|
| (F) ㉒ | GRAVELLY, COBBLY TOPSOIL, ROOTS TO 1' + |
| ㉓<br>TIMBER DEBRIS → | FILL, CALCINES AND WASTE ROCK, SL. MOIST, ANGULAR, PYRITE CRYSTALS EVIDENT IN SOME ROCK, OXIDIZED, BOULDERS TO 24", OXIDIZED, ~4% BOULDERS, ~40 % COBBLES, 30% GRAVEL, ~30 % SAND + FINES, (MOSTLY SAND), 10YR 5/8 (OXIDIZED ROCK), 10YR 3/2, V. DARK GRAYISH BROWN (SANDS) |
| ㉔ | SANDY GRAVELLY COBBLES. (PROBABLE ALLUVIUM), INFILTRATED W/ CALCINES, SUBROUNDED TO ROUNDED, W/ SOME SUBANGULAR POSSIBLY REWORKED MATERIAL, COLOR DARK PURPLISH BLACK (NO MUNSELL COLOR) |
| | PREDOM COLORS |

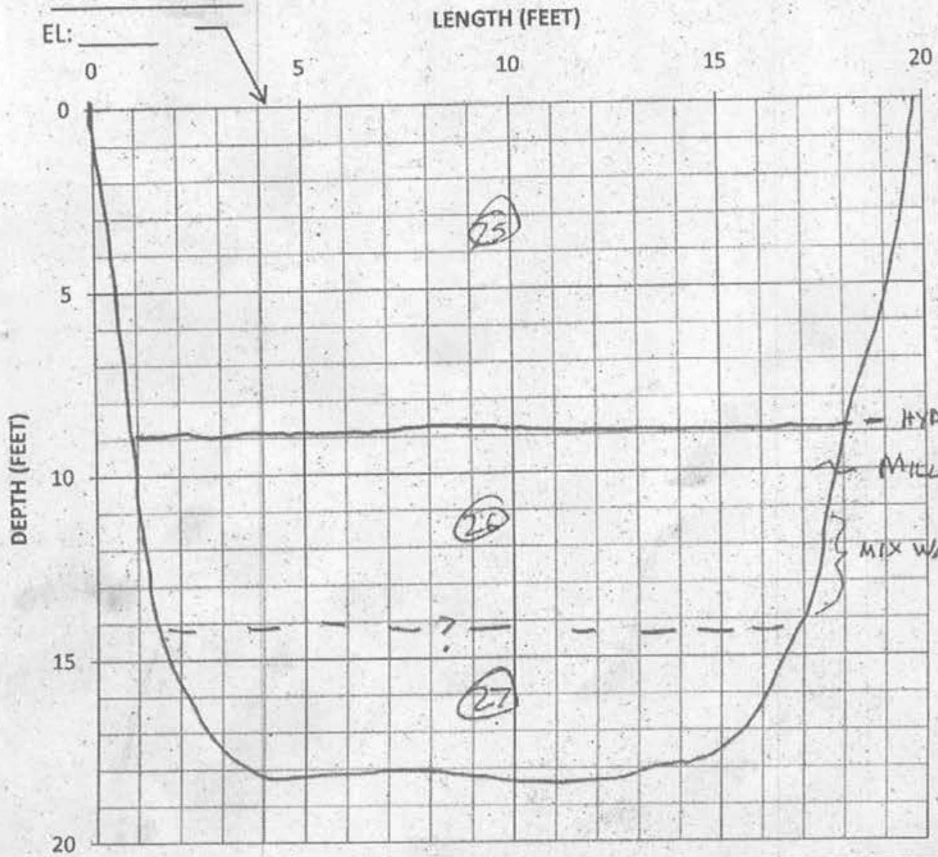
# TEST PIT LOG

**TEST PIT #** TP 2011-10

PROJECT: Rico St. Louis Ponds
NO:
DATE: 22 SEP 11
LOGGED BY: ACJ
WEATHER:
EXCAVATION METHOD:
LOCATION: DUE EAST OF SOIL LEAD REPOSITORY, NEAR FLOOD DIKE

Start Time: 12:20 PM End Time: Note:

EL:



**NOTES/SAMPLES**

2 5GAL BUCKETS
MAT 25
0'-9'
1 1 GAL BAG
9'-11, MAT 26

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① 25 | |
| 26 | CALCINES, MOIST, SIMILAR TO CALCINES AROUND SITE, SILTY SAND/SANDY SILT, NON-PLASTIC, DK REDDISH PURPLE. BELOW 11.0', APPEARS TO BE MIXED W/ SUBANGULAR TO ANGULAR WASTE ROCK, UP TO 50% COBBLE, BOULDER AND GRAVEL CONTENT IN SOME LAYERS |
| 27 | PROBABLE ALLUVIUM, INFILTRATED W/ CALCINES, BOULDERS, DK REDDISH PURPLE UP TO 24", SUBROUNDED TO ROUNDED, <3% BOULDERS, |

## TEST PIT LOG

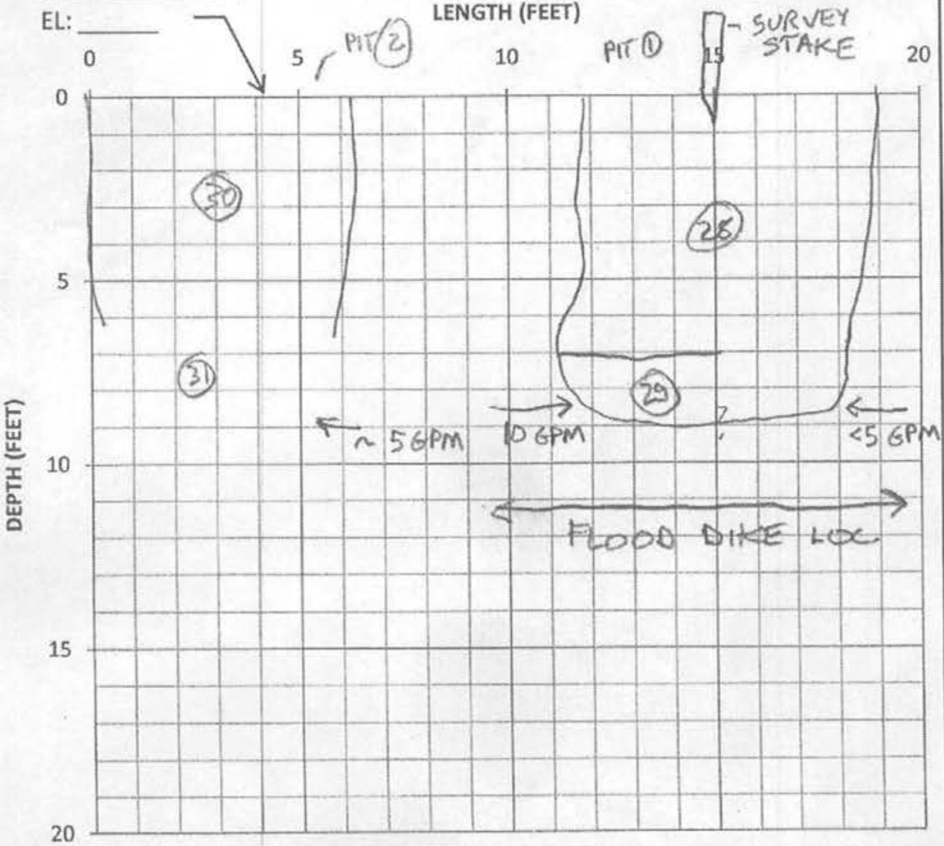
**TEST PIT #** TP2011-11

PROJECT: Rico St. Louis Ponds
NO:
DATE: 22 SEP 11
LOGGED BY: ACJ

WEATHER: SUNNY, 70°F
EXCAVATION METHOD:
LOCATION: FLOOD DIKE, NORTH OF POND 18, ~30' N. OF POWERLINE

Start Time: 1:10 PM
End Time:
Note:

SE
NW
EL:

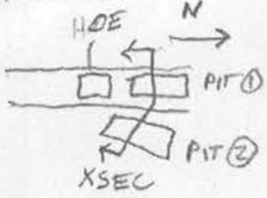


NOTES/SAMPLES

TWO PITS ADJACENT
X SEC @ LEFT
CUT PERPINDICULAR
TO PITS; BACKHOE
TO SW OF SECTION

PIT ① ORIENTED
N-S; PIT ②
ORIENTED NE/SW

UNITS TOO
COARSE TO
COLLECT REP.
SAMPLE



| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① | |

# TEST PIT LOG

TEST PIT #: TP 2011-12

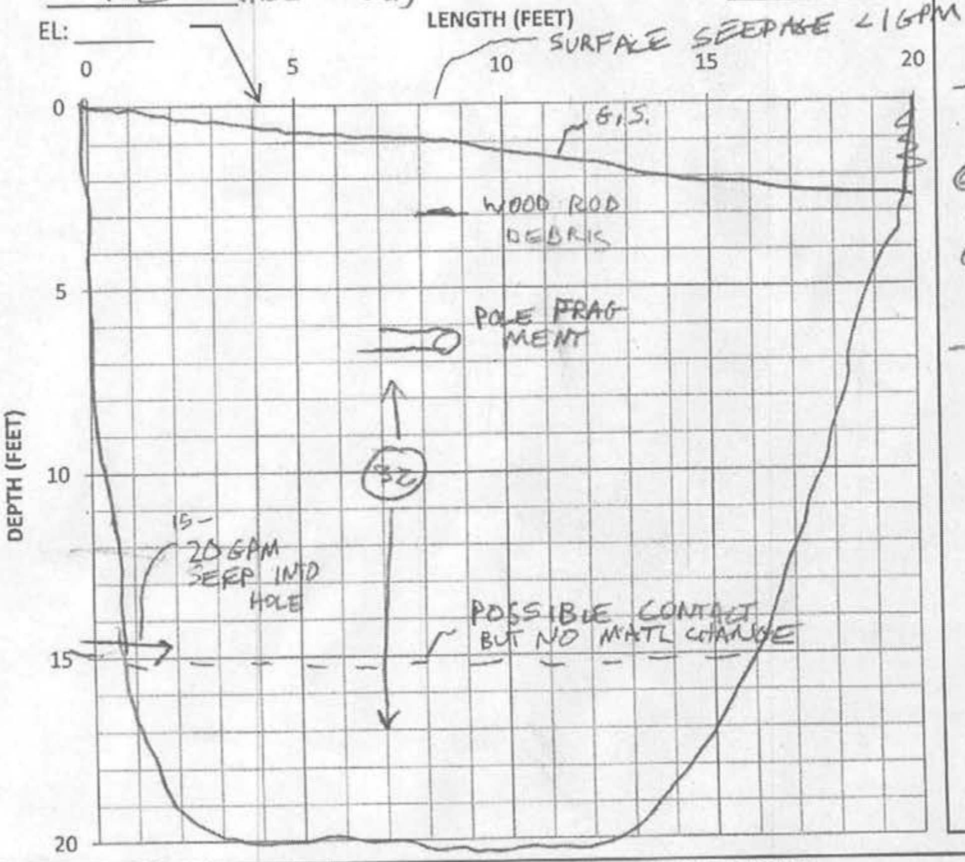
PROJECT: Rico St. Louis Ponds
NO:
DATE: 22 SEP 11
LOGGED BY: ACJ

WEATHER: SUNNY, 65°
EXCAVATION METHOD:
LOCATION: NORTH STACKED REPOSITORY, SE CORNER

Start Time: 1:50pm End Time: 2:35pm Note:

NE (HOE SIDE) SW

EL:



## NOTES/SAMPLES

- LARGE HOLE CAVE FROM 0'-4' @ HOLE DEPTH 8' ON NW SIDE, OPERATOR MOVING TO SW SIDE
- ~~S~~E SIDE OF HOLE CAVE @ 9'

2 5 GAL BUCKETS 3" MINUS ONLY
0-20'
MAT ㉜

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ①㉜ | FILL (LIKELY), REGRADED COLLUVIUM/LANDSLIDE DEBRIS, MOIST TO WET, STRATIFIED, BOULDERS TO 36", 10YR 3/3 (V. DARK BROWN), EST. 5-10% BOULDERS, 10-15% COBBLES, 20% GRAVEL, 20% SAND 35% CLAY FINES, MODERATELY PLASTIC FINES, GRAVEL + COBBLES MOD HARD TO HARD, APPEAR TO BE HERMOSA-DERIVED. |

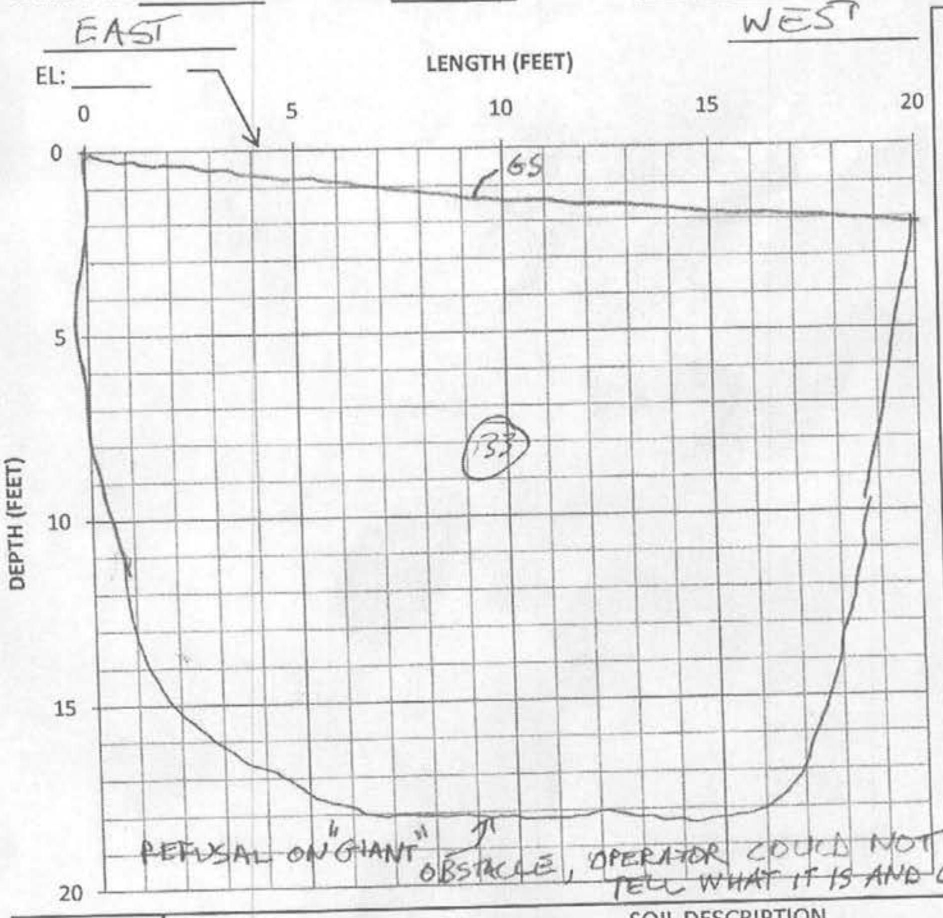
# TEST PIT LOG

TEST PIT #: TP2011-13

PROJECT: Rico St. Louis Ponds
NO:
DATE: 22 SEP 11
LOGGED BY: ACJ

WEATHER: SUNNY, 75°F
EXCAVATION METHOD:
LOCATION: NORTH STACKED REPOS. ~ MIDWAY BETWEEN 2 LOWER (WEST) BORE HOLES

Start Time: 2:40 PM End Time: 3:10 PM Note:



## NOTES/SAMPLES

NO VISIBLE SEEPAGE NOTED

2 5GAL BUCKETS MAT (33) 0'-18'

GIANT HOLE CAVE. 0'-15' JUST ~~PRIOR~~ AFTER TO COMPLETION

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① (33) | SAME MATL AS TP 2011-12, MAT (32), PRIMARILY MOIST, NO WET SEEMS NOTED |

# TEST PIT LOG

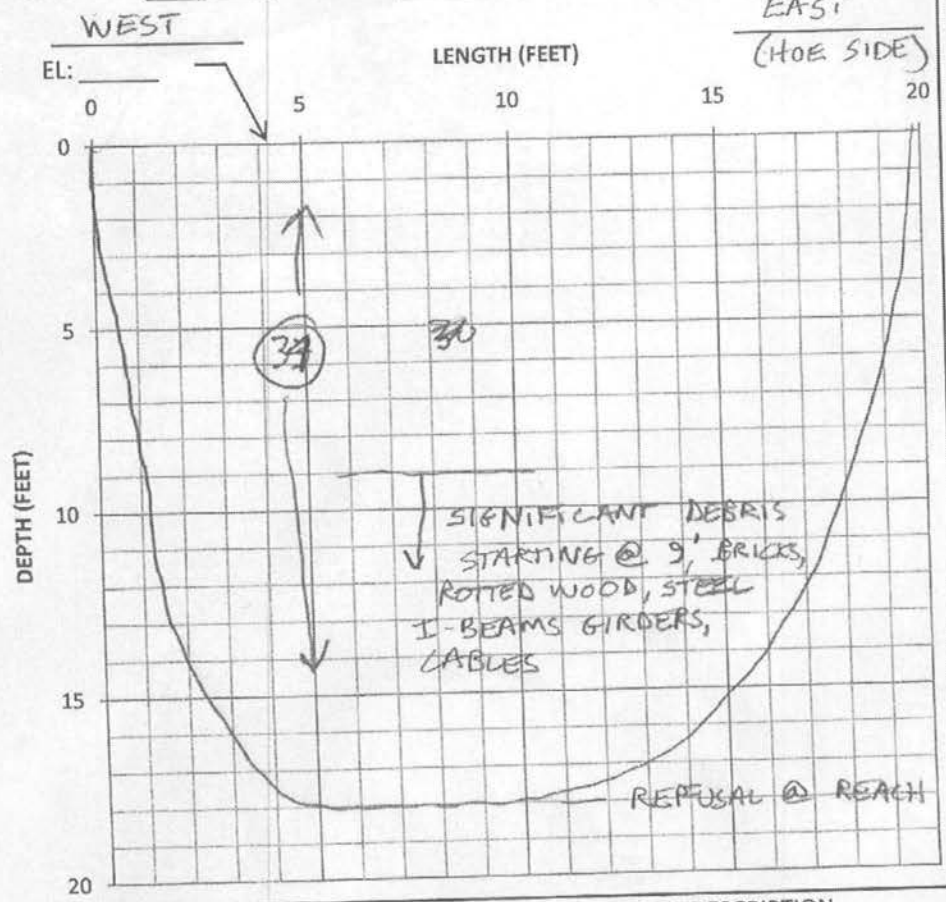
TEST PIT #: TP2011-14

PROJECT: Rico St. Louis Ponds
NO:
DATE: 22 SEP 11
LOGGED BY: ACJ

WEATHER: 65°F SUNNY
EXCAVATION METHOD:
LOCATION: NORTH STACKED REPOS BETWEEN 2 NORTH BOREHOLE LOCATIONS

Start Time:
End Time:
Note:

5A2 4755



SIGNIFICANT DEBRIS STARTING @ 9', BRICKS, ROTTED WOOD, STEEL I-BEAMS GIRDERS, CABLES

REFUSAL @ REACH

NOTES/SAMPLES

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| 34 | SAME MATERIAL AS TP 2011-13, MATERIAL (33), EXCEPT FOR DEBRIS AS NOTED |

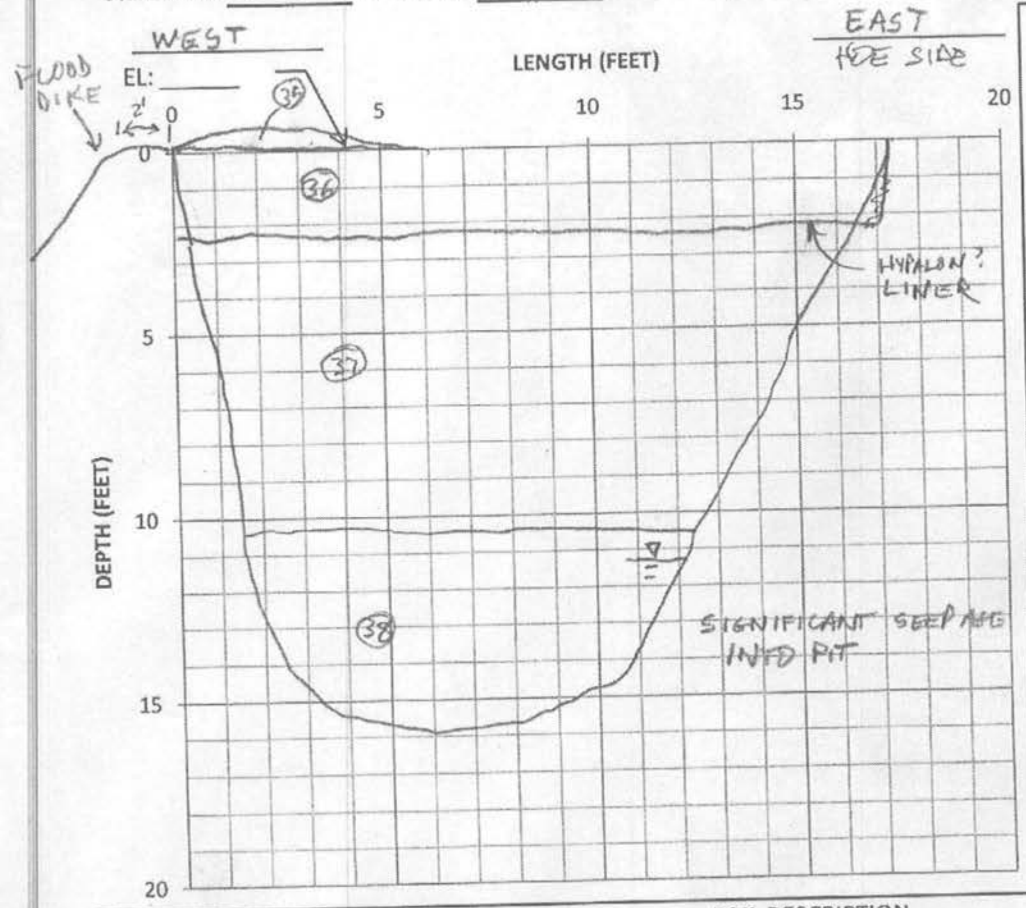
## TEST PIT LOG

TEST PIT #: TP 2011-15

PROJECT: Rico St. Louis Ponds
NO:
DATE: 23 SEP 11
LOGGED BY: ACJ

WEATHER: SUNNY, 40°F
EXCAVATION METHOD:
LOCATION: FLOOD DIKE, N. END OF SITE,

Start Time: 9:55 AM End Time: 10:35 AM Note:



NOTES/SAMPLES

1 5 GAL BUCKET
MAT 36

2 5 GAL BUCKETS
MAT 37 *

1 5 GAL BUCKETS
MAT 38 *

* - -3" (APPROX) ONLY

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① | |
| ㉟ | FILL, SANY GRAVEL, PROCESSED MATL., MAX SIZE = 36", ~$\overset{5}{6}$0% GRAVEL, 40% SAND, 10% SILT FINES, ANGULAR TO ROUNDED. |
| ㊱ | FILL, CLAYEY SANDY GRAVEL, MAX SIZE = 2", ~35% GRAVEL, 30% SAND, 35% CLAY FINES, FINES MOD. PLASTIC, GRAVEL SUB ROUNDED TO SUB ANGULAR W/ SOME ANGULAR PARTICLES. 1 GLEY 2.5 N (BLACK) |
| ㊲ | FILL, CLAYEY SANDY GRAVEL, BOULDERS TO 36", ~15% BOULDERS, ~15% COBBLES, ~30% GRAVEL, ~25% SAND, 15% CLAY |
| ㊳ | |

# TEST PIT LOG

TEST PIT #: TP2011-16

PROJECT: Rico St. Louis Ponds

NO:

DATE: 23 SEP 11

LOGGED BY: ACJ

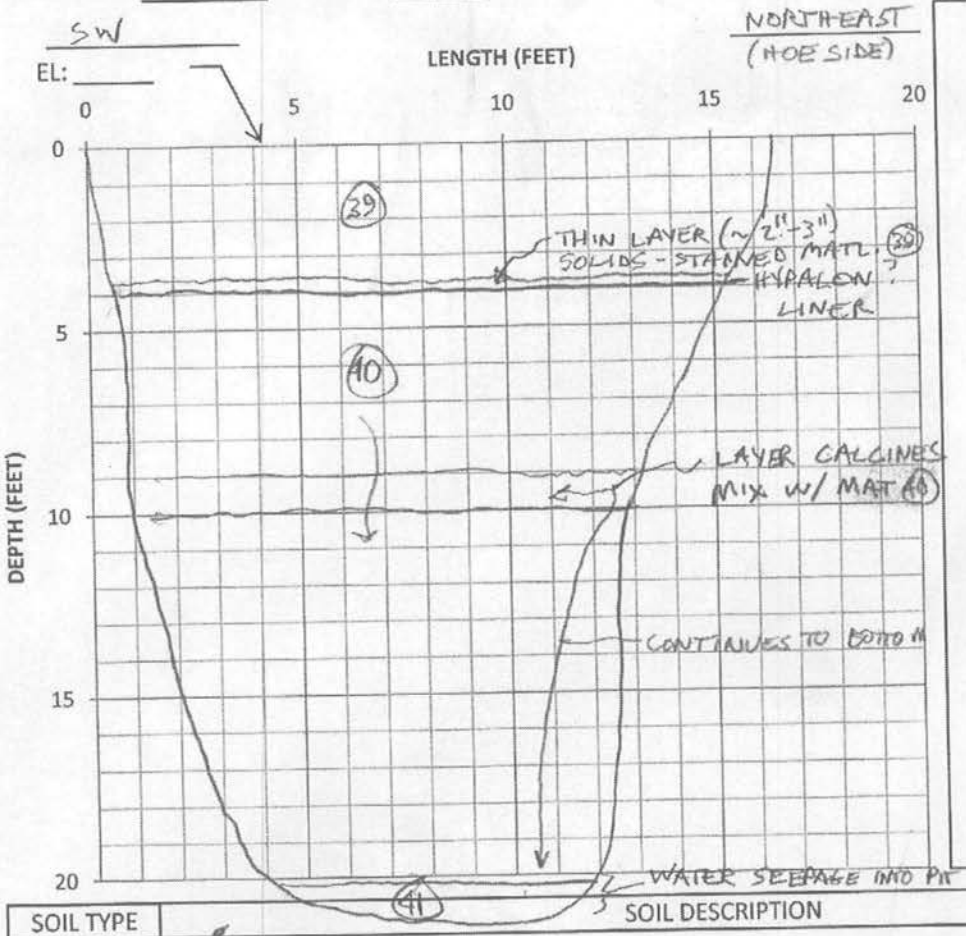
WEATHER: 50°F SUNNY

EXCAVATION METHOD:

LOCATION: MIDDLE OF HEAP LEACH AREA

Start Time: 10:45AM End Time:

Note:



NOTES/SAMPLES

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① | |

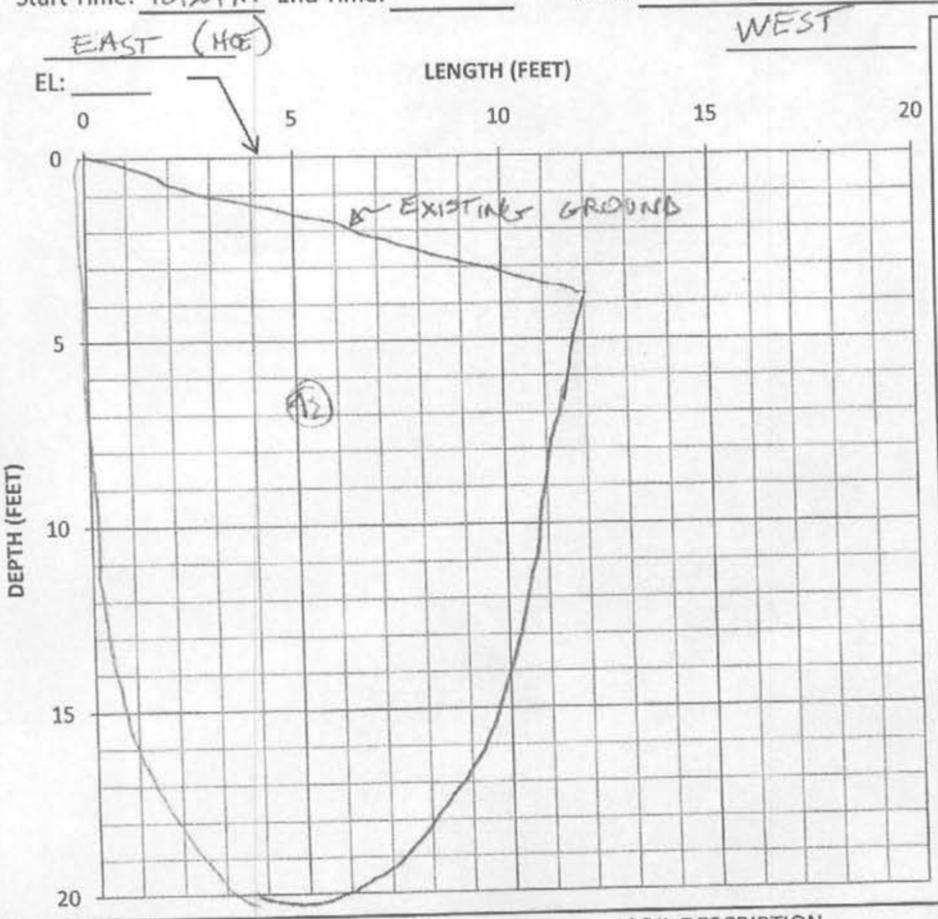
# TEST PIT LOG

TEST PIT #: TP2011-17

PROJECT: Rico St. Louis Ponds
NO:
DATE: 23 SEP 11
LOGGED BY: ACJ

WEATHER: SUNNY, 65°F
EXCAVATION METHOD:
LOCATION: SOUTH STACKED REPOS, N. END

Start Time: 12:30PM End Time: Note:



NOTES/SAMPLES

- HOE SWITCHING TO WEST END, OF PIT @ ~8'
- 2 5GAL BUCKETS MAT ㊷ 3"– ONLY
- FREQUENT SLOUGHING OF HOLE (SEE PHOTOS FOR EXTENTS

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ①<br>㊷ | COLLUVIUM OR POSSIBLE FILL<br>CLAYEY SANDY GRAVEL, MOIST, 10YR 3/3 DARK BROWN, BOULDERS TO 18", ~3% BOULDERS, ~10% COBBLES, ~30% GRAVEL, ~30% SAND, ~25% CLAY FINES, IS FINES MOD PLASTIC, PREDOM. SUBANGULAR TO ANGULAR GRAVEL/COBBLES, WITH SCATTERED SUBROUNDED, MOD. HARD TO HARD ROCK., PROBABLE HERMOSA FM DERIVED. BELOW ~8', ALTERNATING LAYERS OF HIGHER COBBLE AND BOULDER CONTENT (SEE PHOTOS). |

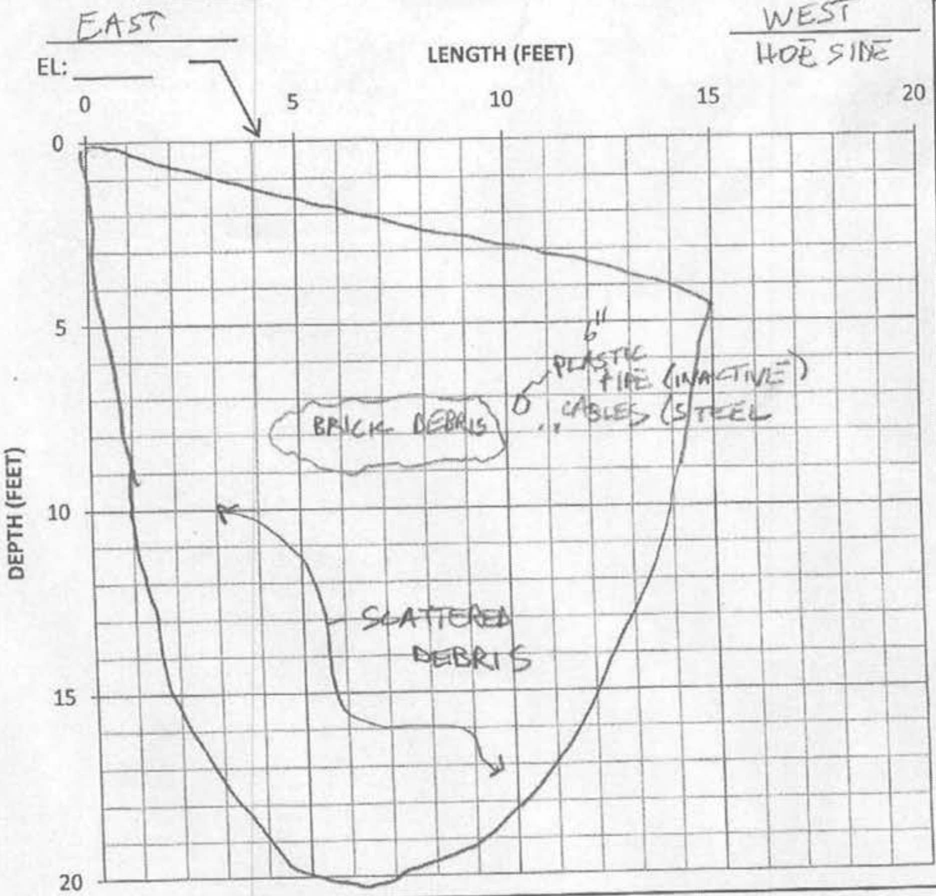
# TEST PIT LOG

TEST PIT #: TP 2011-18

PROJECT: Rico St. Louis Ponds
NO:
DATE: 23 SEP 11
LOGGED BY: ACJ

WEATHER: 65°F SUNNY
EXCAVATION METHOD:
LOCATION: SOUTH STACKED REPOS, MIDDLE

Start Time: 1:30 AM End Time: 2:05 AM Note:



NOTES/SAMPLES

2 5 GAL BUCKETS
0-20'
MAT ㊸

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ㊸ | COLLUVIUM/ COLLUVIUM OVER FILL, SAME AS MAT ㊷, EXCEPT FOR DEBRIS AS NOTED, 24" MAX BOULDER SIZE, WHITE IN PHOTOS IS DISINTEGRATED BRICK |

| TEST PIT LOG | TEST PIT # |
|---|---|
| PROJECT: Rico St. Louis Ponds<br>NO:<br>DATE: 23 SEP 11<br>LOGGED BY: ACJ | TP2011-19 |

WEATHER:

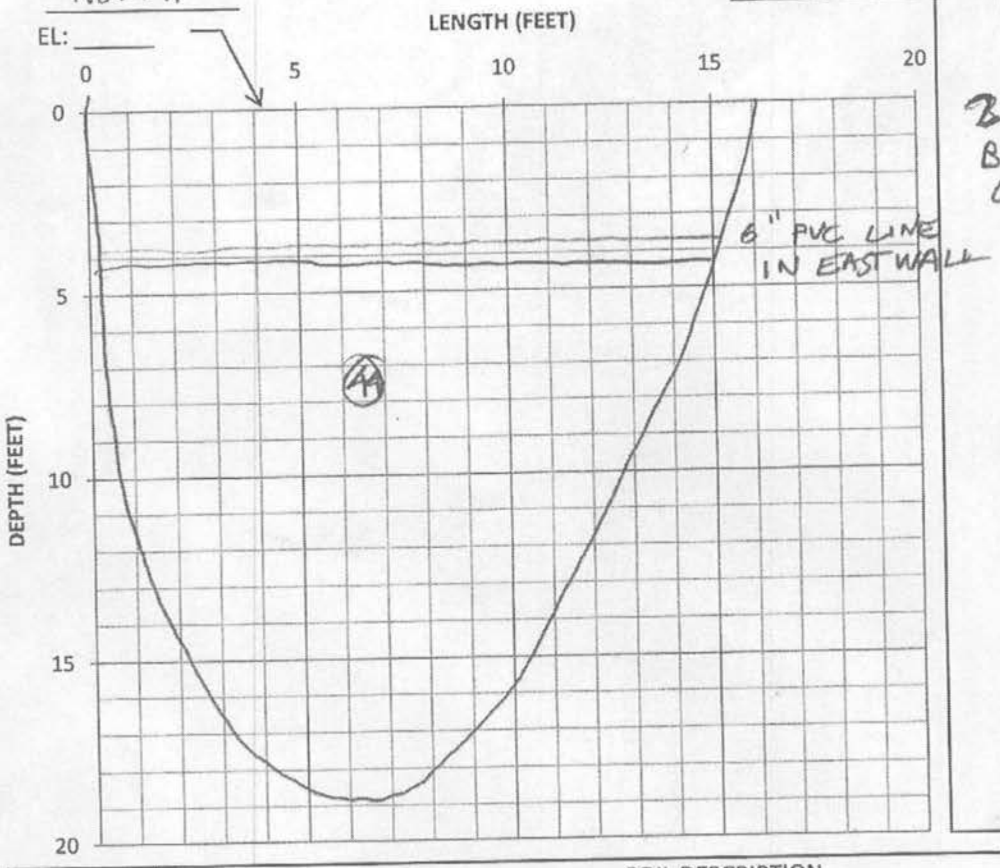
EXCAVATION METHOD:

LOCATION: SOUTH STACKED RESPTORY, SOUTH SIDE, ON ROAD

Start Time: 2:35 PM End Time: 3:15PM Note:

NORTH

SOUTH



NOTES/SAMPLES

2 5 GAL BUCKETS. 0'-20' MAT ㊹

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① | FILL, |

# TEST PIT LOG

TEST PIT #: TP2011-20

PROJECT: Rico St. Louis Ponds

NO:

DATE: 23 SEP 11

LOGGED BY: ACJ

EXCAVATION METHOD: CAT 330 C LONG STICK

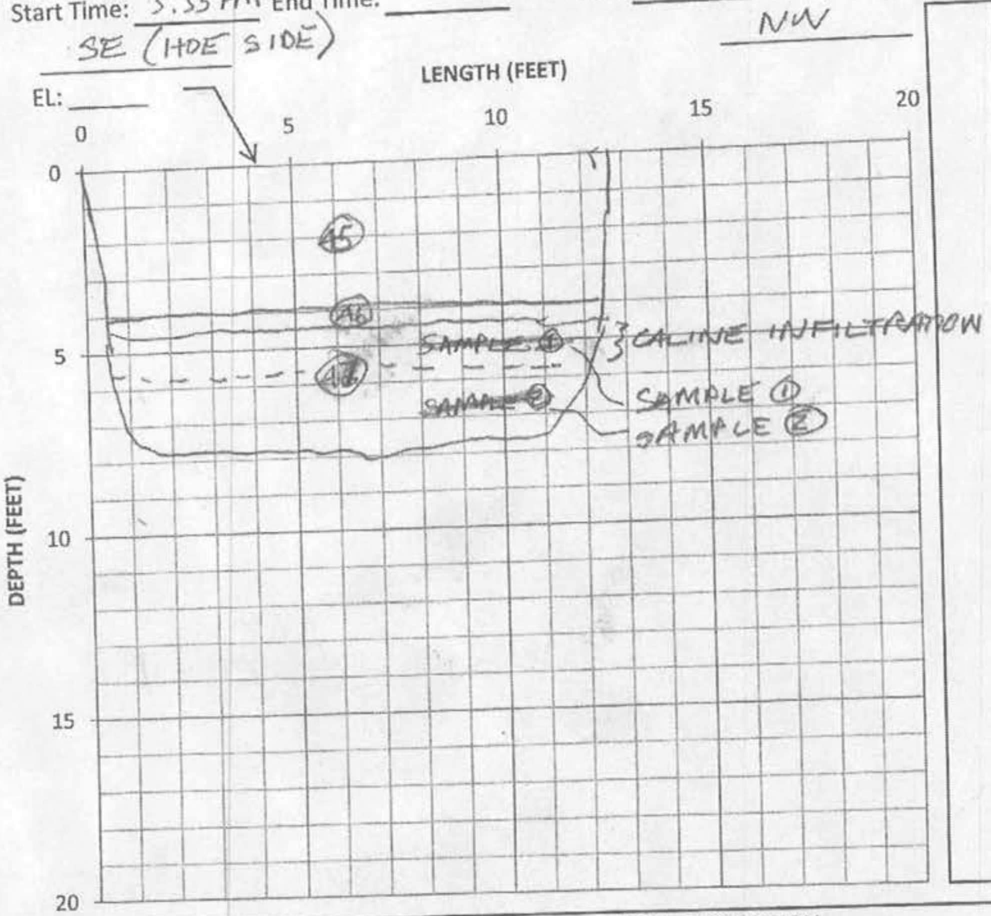
WEATHER: SUNNY, 65°

LOCATION: POND 18, IN POND, N. SIDE OF PENINSULA (SEE PHOTOS) ~25' OUT ON PENINSULA, ~15' OFF SHORE

Start Time: 3:35 PM End Time:

Note:

EL:



NOTES/SAMPLES

| SOIL TYPE | SOIL DESCRIPTION |
|---|---|
| ① | |
| ㊺ | POND 18 SOLIDS |
| ㊻ | CALCINES |
| ㊼ | ALLUVIUM, POSSIBLY REWORKED, INFILTRATED W/ CALCINES TO APPROXIMATELY 1.5', SANDY GRAVEL WITH COBBLES AND BOULDERS. MAX SIZE = 15", ~75% COBBLES, GRAVEL AND BOULDERS, 20% SANDS, <5% FINES |

# Prior Field Exploration Logs

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-1 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 11'<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: HSA. HOLE DIAMETER: FLUID USED: NA | | DATE STARTED: 10/8/08<br>DATE COMPLETED: 10/8/08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | clayey silt with some sand and gravel; brown, moist | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | 50% | | | |
| 7 | | | | | | | |
| 8 | | | | | | Silty sand & gravel dk. brown, moist | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | ☒ | 12<br>9<br>13 | 50% | | Water – saturated | |
| 12 | | | | | | | |
| 13 | | | | | | Cobbles | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | ☒ | 13<br>33<br>27 | 60% | | Saturated cobbles/boulders | |
| 17 | | | | | | | |
| 18 | | ☒ | 50/½" | 0 | | Refusal @ 17.5' | |
| 19 | | | | | | | |

NOTES

TD= 17.5'

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME:<br>PROJECT NO.: Rico Ponds | BORING NUMBER: DH-2 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 14<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: HSA<br>HOLE DIAMETER:<br>FLUID USED: NA | | DATE STARTED: 10/8/08<br>DATE COMPLETED: |

CASING TYPE AND SIZE:
SCREEN TYPE AND SIZE: NA
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Sandy Silt, brown, moist | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | clayey silt, minor sand and gravel, Red, moist | |
| 5 | | | | | | | |
| 6 | | ☒ | 8<br>6 | 25% | | | |
| 7 | | | 4 | | | Sandy Silt with gravel, brown, moist | |
| 8 | | | | | | | |
| 9 | | | | | | clayey Silt with some gravel & Cobbles, brown, moist | |
| 10 | | | | | | | |
| 11 | | ☒ | 24<br>4 | 0 | | | |
| 12 | | | 3 | | | Red wet silty sand - clean<br>– No Recovery – | |
| 13 | | ☒ | 15<br>15 | | | | drilling on Cobble |
| 14 | | | 8 | Wood | | Brown Clayey silt with gravel and cobbles, moist | |
| 15 | | | 6 | Wood | | | > wood in SS |
| 16 | | ☒ | 15 | | | Wood debris water @ 14 | |
| 17 | | | 14<br>50/3 | 50% | | Sand & gravel, saturated w/ cobbles | |
| 18 | | ☒ | 24 | 50% | | | |
| 19 | | | 37<br>38 | | | Silt with some sand and wood debris, brown, saturated | |
| 20 | | | | | | sand and gravel, saturated w/ Cobbles | |

Drilling refusal @ 18.5

TD= 18.5

NOTES

Try shelby at 5'. Hit rock, switched to SPT
Too many rocks
Drove SPT @ 12' - hit wood' - Recovered ~ 1'. Smells like creosote
Try shelby at 14-16 - hit wood

Note - Cobbles throughout hole.

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-3 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: HSA<br>HOLE DIAMETER:<br>FLUID USED: NA | | DATE STARTED:<br>DATE COMPLETED: 10/9/08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Red silty sand with ground calcine tailings | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | ☒ | | | | | |
| 6 | | | 6<br>4<br>4 | 10% | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | No recovery, Shelby pushed 24" then free fell another 12".<br>Drilled into void. Bottom of auger at 10'. Tape measured to 16'.<br>Used mirror to look into boring. Cavity opens to the south. Moving rig to another location ~ 30' to the west. | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

NOTES

TD= 10'

Driller thought we hit the void at ~ 8'.

ANDERSON

# BORING LOG

PAGE 1 OF 2

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-3 R | COORDINATES OR LOCATION: / |
| LOGGED BY: K-Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 24<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: HSA | HOLE DIAMETER: | FLUID USED: NA |
| DATE STARTED: 10/9/08<br>DATE COMPLETED: | | |

CASING TYPE AND SIZE: NA
SCREEN TYPE AND SIZE:
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | silty sand and gravel, Brown, | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | 75% | | piece of mine waste Rock (oxidized) in tip of shelby. | |
| 13 | | | | | | | |
| 14 | | | | | | Sandy silt with clay Brown moist | |
| 15 | | | | | | | |
| 16 | | | 3<br>2<br>2 | ? | | Oxidized (red/orange/yellow) Sand with some silt & fine gravel. Moist | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | 60% | | | |
| 23 | | | | | | Lt Brown? wet sandy silt. | |
| 24 | | | | | | Water | |
| 25 | | | | | | | |
| 26 | | | 10<br>10<br>10 | 50% | | Saturated coarse sand, Gray | |
| 27 | | | | | | Saturated Coarse sand and gravel; Gray/Brown | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |
| 31 | | | 10<br>10<br>13 | 50% | | | |
| 32 | | | | | | | |

NOTES

TD= ______

20' Shelby - rock at bottom; Completely sealed end.

ANDERSON

# BORING LOG

PAGE 2 OF 2

| | | |
|---|---|---|
| PROJECT NAME:<br>PROJECT NO.: | BORING NUMBER: D4-3A | COORDINATES OR LOCATION: / |
| LOGGED BY:<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: | HOLE DIAMETER: / FLUID USED: | DATE STARTED:<br>DATE COMPLETED: |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | | | |
| 36 | | ☒ | 17<br>17<br>14 | | | | |
| 37 | | | | | | | |
| 38 | | | | | | | |

NOTES

TD= 35

# BORING LOG

PAGE 1 OF 1

| | | | |
|---|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-4 | | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | | GWL DEPTH (ENCOUNTERED) 11<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: HSA | HOLE DIAMETER: | FLUID USED: NA | DATE STARTED:<br>DATE COMPLETED: 10/7/08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Silty sand + gravel | |
| 2 | | | | | | | |
| 3 | | | | | | Red Silty gravel - calcine ? | |
| 4 | | | | | | | |
| 5 | | | | | | Silty sand w/ gravel | |
| 6 | | X | 8<br>7<br>5 | | | Minor clay | |
| 7 | | | | | | | |
| 8 | | | | | | Black silt with clay | |
| 9 | | | | | | | |
| 10 | | | | | | Clayey gravel | |
| 11 | | X | 4<br>3<br>2 | | — | Water — | |
| 12 | | | | | | | |
| 13 | | | | | | Silty gravel w/ clay | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | X | 0<br>4<br>8 | | | saturated Gray / dk Brown Silty, clay | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | Saturated silt - Dk. Brown Flowing. | |
| 20 | | | | | | | |
| | | X | 50/4" | 30% | | Silty sand and gravel dk. brown! | |

NOTES

TD= 20.5

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Raco Ponds<br>PROJECT NO.: | BORING NUMBER: DH-5 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 11<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: HSA<br>HOLE DIAMETER:<br>FLUID USED: NA | | DATE STARTED: 10/7/08<br>DATE COMPLETED: 10/7/08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Silty sand + gravel | |
| 2 | | | | | | | |
| 3 | | | | | | sandy gravel ag silt | |
| 4 | | | | | | | |
| 5 | | | 4 | | | | |
| 6 | | X | 10 | 25% | | sandy silt with gravel. | |
| 7 | | | 6 | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | 3 | | | | |
| 11 | | X | 5 | 1% | | Hit rock - no recovery | |
| 12 | | | 4 | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | I | | | | Saturated Sandy SILT<br>w/ some minor small gravel | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | X | 24/6 | | | Silty Sand and gravel<br>Saturated | |
| 22 | | | 50/6 | | | | |
| 23 | | | | | | Cobbles - refusal @ 23' | |
| 24 | | | | | | | |
| 25 | | | | | | | |

NOTES

TD= 23'

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-6 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 10<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: HSA<br>HOLE DIAMETER:<br>FLUID USED: NA | | DATE STARTED: 12/7/08<br>DATE COMPLETED: 12/7/08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

California

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Brown silty sand and Gravel | |
| 2 | | | | | | | |
| 3 | | | | | | Sandy gravel | |
| 4 | | | | | | | |
| 5 | | X | 30 | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | Wet brown sandy silt & gravel | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | X | 13<br>7<br>7 | | | saturated light Brown sand & gravel | water in hole |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | 75% | | Cobbles | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | tan saturated sand | |
| 22 | | | | 25% | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |

NOTES

TD= 25

Attempted Shelby @ 15'. Rock in auger. Shelby destroyed w/ no sample recovery. Pushed out plug w/ center punch. Attempting another shelby

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-7 | COORDINATES OR LOCATION: – x |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 10<br>GWL DEPTH (STATIC) NA. |
| DRILLING METHOD: HSA<br>HOLE DIAMETER:<br>FLUID USED: NA | | DATE STARTED: 10/9/08<br>DATE COMPLETED: 10/9/08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Brown silty sand and gravel | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | ☒ | 24<br>50/4" | 25% | | Wet brown silty sand and gravel | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | Some clay present | |
| 10 | | | | | | | |
| 11 | | ☒ | 35<br>19<br>44 | 60% | | Saturated sand & gravel<br>with some silt | Hard drilling - cobbles |
| 12 | | | | | | | |
| 13 | | | | | | Sandy silt with gravel & cobbles | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | \| | | | | Silty sand with gravel | |
| 17 | | | | 100% | | | |
| 18 | | | | | | ? | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | ☒ | 4<br>9<br>11 | 100% | | Silt with fine sand<br>saturated, lt brown | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |

NOTES

TD= 21.5

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: RICO PONDS
PROJECT NO.:
BORING NUMBER: DH 8
COORDINATES OR LOCATION:
LOGGED BY: K. COSPER
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH (ENCOUNTERED) 6
GWL DEPTH (STATIC) NA.
DRILLING METHOD: HSA
HOLE DIAMETER:
FLUID USED: NA
DATE STARTED: 10/9/08
DATE COMPLETED: 10/9/08
CASING TYPE AND SIZE: NA
SCREEN TYPE AND SIZE: NA
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Silty Sand and Gravel, Brown | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | ☒ | 9<br>8<br>29 | | | water - saturated | |
| 7 | | | | | | | |
| 8 | | | | | | Saturated brown sandy silt with gravel | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | ☒ | 21<br>30<br>20 | | | | |
| 12 | | | | | | Cobbles & Boulders | |
| 13 | | | | | | Refusal @ 12' | |

NOTES

TD= 12'

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: RICO PONDS
PROJECT NO.:
BORING NUMBER: DH-9
COORDINATES OR LOCATION:
LOGGED BY: K. Cosper
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH (ENCOUNTERED) ~ 17
GWL DEPTH (STATIC) NA
DRILLING METHOD: HSA
HOLE DIAMETER:
FLUID USED: NA
DATE STARTED: 10/8/08
DATE COMPLETED:
CASING TYPE AND SIZE: NA
SCREEN TYPE AND SIZE: NA
FROM ______ A.G.S TO ________ B.G.S.
FROM ______ TO ________ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Red Calcine tailings | |
| 2 | | | | | | Silty Sand | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | ☒ | 4<br>4<br>4 | 70% | | Thin layer" of gray saturated | |
| 12 | | | | | | silt @ 11' | |
| 13 | | | | | | | |
| 14 | | | | | | Red silty sand Calcine | |
| 15 | | | | | | Tailings | |
| 16 | | | | | | | |
| 17 | | | | | | Sand & Gravel - Saturated | |
| 18 | | | | | | Black | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | ☒ | 12<br>24<br>30 | | | | |
| 22 | | | | | | | |
| 23 | | | | | | Refusal @ 23.5' | |
| 24 | | | | | | | |
| 25 | | | | | | | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

NOTES

TD= 23.5'

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-10 | COORDINATES OR LOCATION: |
| LOGGED BY: K Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) ~13<br>GWL DEPTH (STATIC) NA |

| | | | |
|---|---|---|---|
| DRILLING METHOD: HSA | HOLE DIAMETER: | FLUID USED: NA | DATE STARTED: 10/7/08<br>DATE COMPLETED: 10/7/08 |

| | |
|---|---|
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | FROM _____ A.G.S TO _____ B.G.S.<br>FROM _____ TO _____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Brown silty sand + gravel | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | Brown clayey silt w/ minor gravel | |
| 6 | | | | <25% | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | 33% | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | Saturated dk brown-gray silt with minor gravel | |
| 15 | | | 10<br>26<br>50/2 | <25% | | | |
| 16 | | | | | | Saturated brown sand & gravel some minor silt | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | Rock encountered at 17' | |
| 20 | | | | | | | |
| | | | | | | Refusal @ 17' | |

NOTES

TD= 17'

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME:<br>PROJECT NO.: | RICO PONDS | BORING NUMBER: | DH-11 | COORDINATES OR LOCATION: | |
| LOGGED BY:<br>CHECKED BY: | K. COSPER | SURFACE ELEVATION: | | GWL DEPTH (ENCOUNTERED)<br>GWL DEPTH (STATIC) | ~20<br>NA |
| DRILLING METHOD: | HSA | HOLE DIAMETER: | | FLUID USED: | NA |
| DATE STARTED:<br>DATE COMPLETED: | 10/8/08 | | | | |

CASING TYPE AND SIZE:
SCREEN TYPE AND SIZE: NA

FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Brown Clayey silt, moist<br>Minor gravel | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | Red silty Sand. Calcine tailings | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | Red Silt - Calcine tailings | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | ☒ | 27<br>50/1" | | | Sand + gravel, saturated red/brown w/ Cobbles<br>Refusal @ 21' | |
| 22 | | | | | | | |

TD= 21

NOTES

Attempted Shelby @ 10' but sample pulled out - 0 Recovery

ANDERSON

# BORING LOG

PAGE 1 OF 2

| | | | |
|---|---|---|---|
| PROJECT NAME:<br>PROJECT NO.: Rico Ponds | BORING NUMBER: DH-12 R | COORDINATES OR LOCATION: | |
| LOGGED BY: K. Casper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 43'<br>GWL DEPTH (STATIC) NA | |
| DRILLING METHOD: ODEX | HOLE DIAMETER: | FLUID USED: AIR | DATE STARTED: 10/13/08<br>DATE COMPLETED: 10/13/08 |

CASING TYPE AND SIZE:
SCREEN TYPE AND SIZE: NA

FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | Brown Sandy silt with some clay and ~~gravel~~ | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | Brown clayey silt with some sand and small gravel | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | Rock | |
| 11 | | | | | | | |
| 12 | | | | | | Red silty sand with gravel 'Calcine | |
| 13 | | | | | | | |
| 14 | | ☒ | 4 | | | | |
| 15 | | | 5<br>5 | | | Brown Sandy silt with some clay and gravel | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | Brown Sandy Silt with Gravel | |
| 25 | | | | | | | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |
| 31 | | | | | | | |
| 32 | | | | | | | |

NOTES

TD= ________

ANDERSON

# BORING LOG

PAGE 2 OF 2

PROJECT NAME:
PROJECT NO.:
BORING NUMBER: DH-12R
COORDINATES OR LOCATION:
LOGGED BY:
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH (ENCOUNTERED) 43
GWL DEPTH (STATIC) NA
DRILLING METHOD: ODEX
HOLE DIAMETER:
FLUID USED: AIR
DATE STARTED:
DATE COMPLETED:
CASING TYPE AND SIZE: FROM ______ A.G.S TO ______ B.G.S.
SCREEN TYPE AND SIZE: NA FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | | Sandy silt and gravel, minor clay | |
| 36 | | | | | | | |
| 37 | | | | | | | |
| 38 | | | | | | Rock - ~~[illegible]~~ | |
| 39 | | | | | | | |
| 40 | | | | | | Sandy silt and gravel minor clay | |
| 41 | | | | | | | |
| 42 | | | | | | Red rock with some silt & sand | |
| 43 | | | | | | | |
| 44 | | | | | | gravel with some silt | Water @ 43' |
| 45 | | | | | | | |
| 46 | | | | | | Silty gravel | |
| 47 | | | | | | | |
| 48 | | | | | | Clayey silt w/ minor gravel moist - wet | out of water @ 48' |
| 49 | | | | | | | |
| 50 | | | | | | | |
| 51 | | | | | | Sandy gravel with some silt, moist | |
| 52 | | | | | | | |
| 53 | | | | | | harder drilling | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| | | | | | | TD ↑ | |

NOTES

TD= 55'

Some gravel is crushed rock from ODEX hammer bit. Unknown original size.

ANDERSON

# BORING LOG

PAGE 1 OF 2

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-13 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cosper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 8'<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: ODex<br>HOLE DIAMETER:<br>FLUID USED: Air | | DATE STARTED: 10/13/08<br>DATE COMPLETED: |

CASING TYPE AND SIZE: FROM ______ A.G.S TO ______ B.G.S.
SCREEN TYPE AND SIZE: NA FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | Brown silt & sand with some gravel | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | wood debris | |
| 7 | | | | | | | |
| 8 | | | | | | silty sand and gravel moist, brown | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | water @ 8' |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | saturated silty sand and gravel brown | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | saturated lt brown silty gravel | |
| 18 | | | | | | | |
| 19 | | | | | | saturated lt brown silty sand | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | | | ↓ | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | grades more silty | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

NOTES

TD= ______

ANDERSON

# BORING LOG

PAGE 2 OF 2

| | | |
|---|---|---|
| PROJECT NAME: Rico Ponds<br>PROJECT NO.: | BORING NUMBER: DH-13 | COORDINATES OR LOCATION: |
| LOGGED BY: K. Cooper<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH (ENCOUNTERED) 8'<br>GWL DEPTH (STATIC) NA |
| DRILLING METHOD: ODEX<br>HOLE DIAMETER:<br>FLUID USED: AIR | | DATE STARTED: 10/13/08<br>DATE COMPLETED: 10/13/08 |

CASING TYPE AND SIZE: FROM ______ A.G.S TO ______ B.G.S.
SCREEN TYPE AND SIZE: FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 31 | | | | | | | |
| 32 | | | | | | ↓ | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | | | |
| 36 | | | | | | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | | | | | | | |
| 41 | | | | | | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | | Less silty | |
| 46 | | | | | | ↓ | |
| 47 | | | | | | | |
| 48 | | | | | | | |
| 49 | | | | | | | |
| 50 | | | | | | | |
| 51 | | | | | | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| | | | | | | ↑ TD | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

NOTES

TD= 55

State of Wisconsin
Department of Natural Resources

# SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

| | | |
|---|---|---|
| Facility/Project Name<br>St. Louis Ponds Area, Rico, Colorado | License/Permit/Monitoring Number<br>AARCOE0105.00 | Boring Number<br>EW-1 |

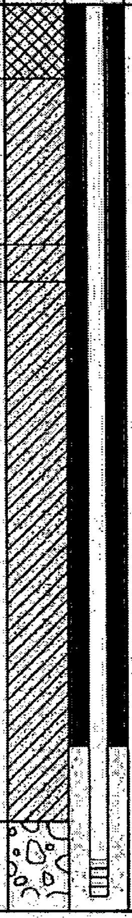
| | | | |
|---|---|---|---|
| Boring Drilled By: Name of crew chief (first, last) and Firm<br>Jeff Pennell<br>Layne-Western | Date Drilling Started<br>11/20/2004 | Date Drilling Completed<br>11/21/2004 | Drilling Method<br>odex |

| | | | | | |
|---|---|---|---|---|---|
| WI Unique Well No. | DNR Well ID No. | Common Well Name<br>EW-1 | Final Static Water Level<br>Feet Site | Surface Elevation<br>8,850.5 Feet Site | Borehole Diameter<br>5.0 inches |

Local Grid Origin ☒ (estimated: ☐ ) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ____ ° ____ ' ____ "
Long ____ ° ____ ' ____ "
Local Grid Location
1389193 Feet ☒ N ☐ S
2268176 Feet ☒ E ☐ W

| | | | |
|---|---|---|---|
| Facility ID | County | County Code | Civil Town/City/ or Village<br>Rico, Colorado |

| Sample: Number and Type | Sample: Length Att. & Recovered (in) | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Soil Properties: Moisture Content | Soil Properties: Liquid Limit | Soil Properties: Plasticity Index | Soil Properties: P 200 | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1<br>SS | 24 | 17-20<br>15-11 | | FILL: Brown, dense, GRAVELLY SAND, some organics in surface soils. | | | | | 35 | | | | | Note: Compressive Strength = SPT N value |
| 2<br>SS | 24 | 5-7<br>7-7 | 2<br>4 | Brown, medium dense, fine to coarse grained CLAYEY SAND, with gravel. | SC | | | | 14 | | | | | Note: Length att. on split spoon = 24" |
| 3<br>SS | 24 | 5-11<br>5-2 | 6 | | | | | | 16 | | | | | |
| | | | | Brown, loose, fine to coarse grained, CLAYEY SAND. | SC | | | | | | | | | |
| 4<br>SS | 24 | 4-4<br>6-3 | 8 | Brown, loose to very dense, fine to coarse grained, CLAYEY SAND and gravel | | | | | 10 | | | | | |
| 5<br>SS | 24 | 2-8<br>4-5 | 10 | | | | | | 12 | | | | | |
| 1<br>SH<br>6<br>SS | 6<br>24 | 5-4<br>2-4 | 12<br>14 | | SC | | | | 6 | | | | | approx. 6 inches recovery |
| 2<br>SH | 24 | | 16 | | | | | | | | | | | |
| 7<br>SS | 24 | 6-8<br>10-8 | 18 | | | | | | 18 | | | | | |
| | | | 20 | | | | | | | | | | | |
| 8<br>SS | 24 | 50 | 22<br>24 | Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay | GP | | | | 50 | | | | | |



I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Daniel R. Reed

Firm **SEH Inc** 421 Frenette Drive
Chippewa Falls, WI 54729
www.sehinc.com
Tel: 715.720.6200
Fax: 715.720.6300

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State of Wisconsin
Department of Natural Resources

**SOIL BORING LOG INFORMATION SUPPLEMENT**
Form 4400-122A

Boring Number EW-1 Use only as an attachment to Form 4400-122. Page 2 of 2

| Sample | | | | | | | | | Soil Properties | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | RQD/ Comments |
| | | | 26 | Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay | GP | | | | | | | | | |
| | | | 28 | End of boring at 28' (refusal) | | | | | | | | | | |

State of Wisconsin
Department of Natural Resources

# SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 1

| | | | | |
|---|---|---|---|---|
| Facility/Project Name<br>St. Louis Ponds Area, Rico, Colorado | | License/Permit/Monitoring Number<br>AARCOE0105.00 | | Boring Number<br>EW-2A |
| Boring Drilled By: Name of crew chief (first, last) and Firm<br>Jeff Pennell<br>Layne-Western | | Date Drilling Started<br>11/21/2004 | Date Drilling Completed<br>11/21/2004 | Drilling Method<br>odex |
| WI Unique Well No. | DNR Well ID No. | Common Well Name | Final Static Water Level<br>Feet Site | Surface Elevation<br>8,846.4 Feet Site | Borehole Diameter<br>5.0 inches |

Local Grid Origin ☒ (estimated: ☐ ) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location
1389198 Feet ☒ N ☐ S 2268004 Feet ☒ E ☐ W

| | | | |
|---|---|---|---|
| Facility ID | County | County Code | Civil Town/City/ or Village<br>Rico, Colorado |

| Sample | | | | | | | | | | Soil Properties | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | RQD/ Comments |
| 1<br>SS | 24 | 1-3<br>12-9 | | FILL: Brown, dense, GRAVELLY SAND, some organics in surface soils. | | ▩ | | | 15 | | | | | Note: Compressive Strength = SPT N value<br>Note: Length att. on split spoon = 24" |
| 2<br>SS | 24 | 3-7<br>4-5 | 2<br>4 | Brown, loose, fine to coarse grained CLAYEY SAND, with gravel. | SC | ▨ | | | 11 | | | | | |
| 3<br>SS | 24 | | 6 | Brown, loose, SANDY CLAY to clayey sand, with gravel. | CL | ▨ | | | | | | | | |
| 4<br>SS | 24 | 3-4<br>3-3 | 8 | Brown, medium stiff, SANDY CLAY, with gravel | CL-MI | ▨ | | | 7 | | | | | |
| 5<br>SS | 24 | 5-8<br>8-17 | 10 | Brown, stiff, SANDY CLAY to clayey sand, with gravel | CL-MI | ▨ | | | 16 | | | | | |
| | | | 12 | End of boring at 12' (abandoned) | | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Daniel R-Reed

Firm **SEH Inc** 421 Frenette Drive
Chippewa Falls, WI 54729
www.sehinc.com
Tel: 715.720.6200
Fax: 715.720.6300

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State of Wisconsin
Department of Natural Resources

# SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

| | | |
|---|---|---|
| Facility/Project Name<br>St. Louis Ponds Area, Rico, Colorado | License/Permit/Monitoring Number<br>AARCOE0105.00 | Boring Number<br>EB-1 |

| | | | |
|---|---|---|---|
| Boring Drilled By: Name of crew chief (first, last) and Firm<br>Jeff Pennell<br>Layne-Western | Date Drilling Started<br>11/15/2004 | Date Drilling Completed<br>11/18/2004 | Drilling Method<br>hsa/odex |

| | | | | | |
|---|---|---|---|---|---|
| WI Unique Well No. | DNR Well ID No. | Common Well Name<br>EB-1 | Final Static Water Level<br>8,820.9 Feet Site | Surface Elevation<br>8,837.9 Feet Site | Borehole Diameter<br>8.0 inches |

Local Grid Origin ☒ (estimated: ☐ ) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location
1388792 Feet ☒ N ☐ S 2267917 Feet ☒ E ☐ W

| | | | |
|---|---|---|---|
| Facility ID | County | County Code | Civil Town/City/ or Village<br>Rico, Colorado |

| Sample | | | | | | | | | | Soil Properties | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | RQD/ Comments |
| 1 SS | 24 | 29-44<br>18-14 | | FILL: Gray, very dense, WASTE ROCK, igneous cobbles | | | | | 62 | | | | | Note: Compressive Strength = SPT N value<br>Note: Length att. on split spoon = 24" |
| 2 SS | 24 | 5-8<br>8-12 | 2 | FILL ("Calcine Tailings"): Purple-maroon to gray, loose to medium dense, fine to very fine grained, SILTY SAND, rare gravel | | | | | 16 | | | | | |
| 3 SS | 24 | 4-9<br>8-11 | 4 | | | | | | 17 | | | | | |
| 4 SS | 24 | 5-5<br>7-7 | 6 | | | | | | 12 | | | | | |
| 1 SH | 24 | | 8 | | | | | | | | | | | |
| 2 SH | 24 | | 10 | | | | | | | | | | | |
| 4 SS | 24 | 5-4<br>4-3 | 12 | | SM | | | | 8 | | | | | |
| 3 SH | 24 | | 14 | | | | | | | | | | | |
| 5 SS | 24 | 2-2<br>6-16 | 16 | | | | ▼ | | 8 | | | | | |
| 4 SH | 24 | | 18 | | | | | | | | | | | |
| 6 SS | 24 | 12-7<br>9-7 | 20 | | | | | | 16 | | | | | |
| 5 SH | 24 | | 22 | | | | | | | | | | | |
| | | | 24 | | GP | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Daniel R. Reed

Firm **SEH Inc**
421 Frenette Drive
Chippewa Falls, WI 54729
www.sehinc.com
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State of Wisconsin
Department of Natural Resources

**SOIL BORING LOG INFORMATION SUPPLEMENT**
Form 4400-122A

Boring Number EB-1 Use only as an attachment to Form 4400-122. Page 2 of 2

| Sample | | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number and Type | Length Att. & Recovered (in) | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| 7<br>SS | 24 | 22-20<br>24-50 | 26<br>28<br>30<br>32 | Brown, dense, fine to coarse GRAVEL (alluvium), much fine to coarse grained sand. | GP |  | | | 44 | | | | | |
| | | | | End of boring at 33' (refusal) | | | | | | | | | | |

State of Wisconsin
Department of Natural Resources

## SOIL BORING LOG INFORMATION
Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

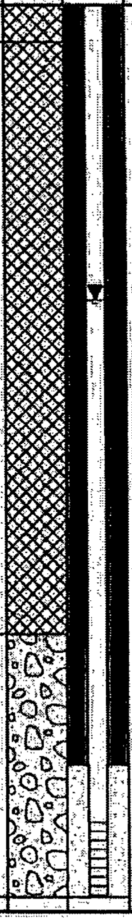
Page 1 of 1

| | | | |
|---|---|---|---|
| Facility/Project Name<br>St. Louis Ponds Area, Rico, Colorado | License/Permit/Monitoring Number<br>AARCOE0105.00 | Boring Number<br>EB-2 | |
| Boring Drilled By: Name of crew chief (first, last) and Firm<br>Jeff Pennell<br>Layne-Western | Date Drilling Started<br>11/19/2004 | Date Drilling Completed<br>11/19/2004 | Drilling Method<br>hollow stem auger |

| | | | | | |
|---|---|---|---|---|---|
| WI Unique Well No. | DNR Well ID No. | Common Well Name<br>EB-2 | Final Static Water Level<br>8,818.8 Feet Site | Surface Elevation<br>8,826.8 Feet Site | Borehole Diameter<br>8.0 inches |

Local Grid Origin ☒ (estimated: ☐ ) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E
Feet ☐ S Feet ☐ W

| | | | |
|---|---|---|---|
| Facility ID | County | County Code | Civil Town/City/ or Village<br>Rico, Colorado |

| Sample: Number and Type | Sample: Length Att. & Recovered (in) | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Soil Properties: Moisture Content | Soil Properties: Liquid Limit | Soil Properties: Plasticity Index | Soil Properties: P 200 | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FILL: Gray, very dense, WASTE ROCK, igneous cobbles | |  | | | | | | | | Note: Compressive Strength = SPT N value<br>Note: Length att. on split spoon = 24" |
| 1 SS | 24 | 4-6<br>4-7 | 2 | FILL("Calcine Tailings"): Purple-maroon to gray, loose to medium dense, fine to very fine grained, SILTY SAND, rare gravel | | | | | 10 | | | | | |
| 2 SS | 24 | 4-4<br>5-4 | 4 | | | | | | 9 | | | | | |
| 3 SS | 24 | 3-3<br>6-3 | 6 | | | | | | 9 | | | | | |
| 4 SS | 24 | 3-2<br>1-1 | 8 | | | | | | 3 | | | | | |
| | | | | | SM | | | | | | | | | |
| | | | 10 | | | | | | | | | | | |
| | | | 12 | | | | | | | | | | | |
| 5 SS | 24 | 1-1<br>1-1 | 14 | | | | | | 2 | | | | | |
| | | | 16 | | | | | | | | | | | |
| | | | 18 | Brown, dense, fine to coarse GRAVEL (alluvium), much fine to coarse grained sand. | | | | | | | | | | |
| 6 SS | 24 | 12-24<br>50 | 20 | | GP | | | | 74 | | | | | |
| | | | 22 | | | | | | | | | | | |
| | | | 24 | End of boring at 24' | | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Daniel R. Reed

Firm **SEH Inc**
421 Frenette Drive
Chippewa Falls, WI 54729
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State of Wisconsin
Department of Natural Resources

## SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

| | | | |
|---|---|---|---|
| Facility/Project Name<br>St. Louis Ponds Area, Rico, Colorado | | License/Permit/Monitoring Number<br>AARCOE0105.00 | Boring Number<br>EB-2D |
| Boring Drilled By: Name of crew chief (first, last) and Firm<br>Jeff Pennell<br>Layne-Western | Date Drilling Started<br>11/18/2004 | Date Drilling Completed<br>11/19/2004 | Drilling Method<br>odex |

| | | | | | |
|---|---|---|---|---|---|
| WI Unique Well No. | DNR Well ID No. | Common Well Name | Final Static Water Level<br>Feet Site | Surface Elevation<br>8,826.0 Feet Site | Borehole Diameter<br>5.0 inches |

Local Grid Origin ☒ (estimated: ☐ ) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location ☒ N ☒ E
1388306 Feet ☐ S 2267920 Feet ☐ W

| | | | |
|---|---|---|---|
| Facility ID | County | County Code | Civil Town/City/ or Village<br>Rico, Colorado |

| Sample: Number and Type | Sample: Length Att. & Recovered (in) | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Soil Properties: Moisture Content | Soil Properties: Liquid Limit | Soil Properties: Plasticity Index | Soil Properties: P 200 | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FILL: Gray, very dense, WASTE ROCK, igneous cobbles | | | | | | | | | | |
| | | | 2 | FILL ("Calcine Tailings"): Purple-maroon to gray, loose to medium dense, fine to very fine grained, SILTY SAND, rare gravel | | | | | | | | | | |
| 1<br>SH | 24 | | 4 | | | | | | | | | | | Note: Compressive Strength = SPT N value<br>Note: Length att. on split spoon = 24"<br>3" diameter split spoon used (no shelby rec) |
| 2<br>SH | 24 | | 6 | | | | | | | | | | | |
| 1<br>SS | 24 | | 8 | | | | | | | | | | | |
| 3<br>SH | 24 | | 10 | | SM | | | | | | | | | |
| 4<br>SH | 24 | | 12 | | | | | | | | | | | |
| | | | 14 | | | | | | | | | | | |
| 2<br>SS | 24 | 4-1<br>1-4 | 16 | | | | | | 2 | | | | | |
| | | | 18 | Brown, dense, fine to coarse GRAVEL (alluvium), much fine to coarse grained sand. | | | | | | | | | | |
| | | | 20 | | | | | | | | | | | |
| | | | 22 | | GP | | | | | | | | | |
| | | | 24 | | | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Daniel R. Reed

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State of Wisconsin
Department of Natural Resources

# SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number EB-2D Use only as an attachment to Form 4400-122. Page 2 of 2

| Sample | | Blow Counts | Depth In Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number and Type | Length Att. & Recovered (in) | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| | | | | End of boring at 24' (abandoned - moved to EB-2, approx. 10' to east) | | | | | | | | | | |

| | | |
|---|---|---|
| CDPHE<br>Colorado Department of Public Health and Environment<br>4300 Cherry Creek Drive South<br>Denver, CO 80246 | # WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY | Records Management Data |

| | |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW1 | Well Location: Rico Light Industrial Park |

| | | | |
|---|---|---|---|
| Time / Date: | 10/16/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting | | Slight Breeze |
| Date Development Started: | 10/16/02 | Date Development Completed: | 10/16/02 |
| Screen Intervals:<br>4ft. To 9 ft bgs | | Well Diameter: | 2 Inch |
| Depth of Well ($L^w$): | 9 ft. | Depth to Water Before Development ($L^t$): | 6.5 ft. |
| Height of Water Column ($L^w$ - $L^t$): | 6 ft. | | |
| Depth to Top of Sediment ($L^i$) | 9 ft. | Sediment Thickness ($L^w$ - $L^i$): | Na ft. |
| Well Volume: | 0.96 gal. | | |
| Total Volume Pumped: | 30 gal. | | |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 30+ volumes pumped on 10/16/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW1

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/16/02 | 11.2 | 7.37 | 359 | 27 | Slightly turbid |
| 10/16/02 | 10.8 | 7.36 | 359 | 29 | Clear, Slightly turbid |

* Sample collection continued after well development includes well development purge volumes

| | |
|---|---|
| 10/16/02 @ 1345 | Sample Collected |

## Lithology

| | |
|---|---|
| 0-9 feet | Native rocky cobble material |

| | | | |
|---|---|---|---|
| Presented By | Date | Checked By | Date |

CDPHE
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
nver, CO 80246

# WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Records Management Data

| | |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW2 | Well Location: Rico Light Industrial Park |

| | | | |
|---|---|---|---|
| Time / Date: | 10/16/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting | | Slight Breeze |
| Date Development Started: | 10/16/02 | Date Development Completed: | 10/16/02 |
| Screen Intervals:<br>10.5 ft. To 20.5 ft bgs | | Well Diameter: | 2 Inch |
| Depth of Well ($L^*$): | 20.5 ft. | Depth to Water Before Development ($L^1$): | 6.5 ft. |
| Height of Water Column ($L^* - L^1$): | 2.0 ft. | | |
| Depth to Top of Sediment ($L^2$) | 20.5 ft. | Sediment Thickness ($L^* - L^2$): | Na ft. |
| Well Volume: | 0.32 gal. | | |
| Total Volume Pumped: | 5 gal. | | |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 4x volumes pumped on 10/16/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW2

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/16/02 | 11.9 | 7.29 | 1004 | Purged dry four times | Clear |
| | | | | Total of 5 gallons max | |

* Sample collection continued after well development includes well development purge volumes

| | |
|---|---|
| | Sample Collected |
| 10/16/02 @ 1620 | |

## Lithology

| | |
|---|---|
| 0-12 feet | Spent pyretic ore with mixed coble and rock. Ore materials are green and purple in color. Leach pad liner at 12 feet bgs |
| 12-20.5 feet | Native rocky cobble material |

| | | | |
|---|---|---|---|
| **Presented By** | Date | **Checked By** | Date |

J:\BROWNFIELDS\TBA\BROWNFIELDS ASSESSMENTS\RICO\ARR\WELL FORMS\RLP-GW2.DOC

| | | |
|---|---|---|
| CDPHE<br>Colorado Department of Public Health and Environment<br>4300 Cherry Creek Drive South<br>enver, CO 80246 | # WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY | Records Management Data |

| | |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW3 | Well Location: Rico Light Industrial Park |

| | | | |
|---|---|---|---|
| Time / Date: | 10/16/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting | | Slight Breeze |
| Date Development Started: | 10/16/02 | Date Development Completed: | 10/16/02 |
| Screen Intervals:<br>7 ft. To 16.5 ft bgs | | Well Diameter: | 2 Inch |
| Depth of Well ($L^w$): | 16.5 ft. | Depth to Water Before Development ($L^t$): | 6.5 ft. |
| Height of Water Column ($L^w$ - $L^t$): | 9.5 ft. | | |
| Depth to Top of Sediment ($L^s$) | 16.5 ft. | Sediment Thickness ($L^w$ - $L^s$): | Na ft. |
| Well Volume: | 1.12 gal. | | |
| Total Volume Pumped: | 15 gal. | | |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 14 volumes pumped on 10/16/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW3

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/16/02 | 11.6 | 6.46 | 1526 | 5 | Slightly turbid |
| 10/16/02 | 10.9 | 6.45 | 1529 | 7 | Slightly turbid |
| 10/16/02 | 10.6 | 6.44 | 1484 | 8 | Slightly turbid |
| 10/16/02 | 10.8 | 6.42 | 1512 | 9 | Clear, Slightly turbid |

* Sample collection continued after well development includes well development purge volumes

| | |
|---|---|
| 10/16/02 @ 1100 | Sample Collected |

## Lithology

| | |
|---|---|
| 0-3.5 feet | Spent pyretic ore with mixed coble and rock. |
| 3.5-16.5 feet | Native rocky cobble material |

| | | | |
|---|---|---|---|
| **Presented By** | **Date** | **Checked By** | **Date** |

**CDPHE**

Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
enver, CO 80246

# WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Records Management Data

|  |  |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW4 | Well Location: Rico Light Industrial Park |

|  |  |  |  |
|---|---|---|---|
| Time / Date: | 10/16/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting |  | Slight Breeze |
| Date Development Started: | 10/16/02 | Date Development Completed: | 10/16/02 |
| Screen Intervals:<br>4ft. To 14 ft bgs |  | Well Diameter: | 2 Inch |
| Depth of Well ($L^w$): | 14 ft. | Depth to Water Before Development ($L^t$): | 7 ft. |
| Height of Water Column ($L^w$ - $L^t$): | 7 ft. |  |  |
| Depth to Top of Sediment ($L^j$) | 14ft. | Sediment Thickness ($L^w$ - $L^j$): | Na ft. |
| Well Volume: | 1.12 gal. |  |  |
| Total Volume Pumped: | 27 gal. |  |  |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 25+ volumes pumped on 10/16/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW4

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/16/02 | 14.0 | 7.20 | 1385 | 24 | Slightly turbid |
| 10/16/02 | 13.5 | 7.20 | 1380 | 25 | Slightly turbid |
|  | 13.7 | 7.20 | 1383 | 27 | Slightly turbid |

* Sample collection continued after well development includes well development purge volumes

|  |  |
|---|---|
| 10/16/02 @ 1600 | Sample Collected |

## Lithology

|  |  |
|---|---|
| 0-2 feet bgs | Gravel fill material |
| 2-14 feet bgs | Rip rap materials and cobble |

|  |  |  |  |
|---|---|---|---|
| **Presented By** | **Date** | **Checked By** | **Date** |

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**CDPHE**

Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246

# WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Records Management Data

| | |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW5 | Well Location: Rico Light Industrial Park |

| | | | |
|---|---|---|---|
| Time / Date: | 10/17/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting | | Slight Breeze |
| Date Development Started: | 10/17/02 | Date Development Completed: | 10/17/02 |
| Screen Intervals:<br>18 ft. to 23 ft bgs | | Well Diameter: | 2 Inch |
| Depth of Well ($L^w$): | 23 ft. | Depth to Water Before Development ($L^l$): | 15 ft. |
| Height of Water Column ($L^w - L^l$): | 8 ft. | | |
| Depth to Top of Sediment ($L^s$) | 14ft. | Sediment Thickness ($L^w - L^s$): | Na ft. |
| Well Volume: | 1.28 gal. | | |
| Total Volume Pumped: | 46 gal. | | |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 46 gallons purged on 10/17/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW5

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/17/02 | 13.8 | 6.89 | 2620 | 45 | Slightly turbid |
| 10/17/02 | 13.4 | 6.90 | 2620 | 45.5 | Clear, Slightly turbid |
| | 13.7 | 6.91 | 2610 | 46 | Clear |

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1145 Sample Collected

## Lithology

| | |
|---|---|
| 0-2 feet bgs | Waste rock materials |
| 2-23 feet bgs | Purple roasted tailings, wet |

| | | | |
|---|---|---|---|
| **Presented By** | **Date** | **Checked By** | **Date** |

**CDPHE**
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
ver, CO 80246

# WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Records Management Data

| | |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW6 | Well Location: Rico Light Industrial Park |

| | | | |
|---|---|---|---|
| Time / Date: | 10/17/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting | | Slight Breeze |
| Date Development Started: | 10/17/02 | Date Development Completed: | 10/17/02 |
| Screen Intervals:<br>12 ft. to 17 ft bgs | | Well Diameter: | 2 Inch |
| Depth of Well ($L^w$): | 30 ft. | Depth to Water Before Development ($L^s$): | 25 ft. |
| Height of Water Column ($L^w - L^s$): | 5 ft. | | |
| Depth to Top of Sediment ($L^t$) | 30ft. | Sediment Thickness ($L^w - L^t$): | Na ft. |
| Well Volume: | 0.8 gal. | | |
| Total Volume Pumped: | 8 gal. | | |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 8+ volumespurged on 10/17/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW6

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/17/02 | 13.1 | 6.49 | 4000 | 6 | Slightly turbid |
| 10/17/02 | 12.6 | 6.38 | 3970 | 7 | Clear, Slightly turbid |
| 10/17/02 | 13.1 | 6.42 | 4110 | 8 | Clear |

* Purged dry total of 8 times, Collected sample on 9th recharge

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1645 Sample Collected

## Lithology

| | |
|---|---|
| 0-18 feet bgs | Purple roasted tailings mixed with waste rock and river cobble |
| 18-30 feet bgs | Native Rock, Cobble |

| | | | |
|---|---|---|---|
| Presented By | Date | Checked By | Date |

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CDPHE
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
nver, CO 80246

# WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Records Management Data

| | |
|---|---|
| Project Number: Rico Light Industrial Park | Project Name: Rico Light Industrial Park |
| Well Number: RLP-GW7 | Well Location: Rico Light Industrial Park |

| | | | |
|---|---|---|---|
| Time / Date: | 10/17/02 | Elevation : | 8,800 msl |
| Drilling Method: | 4-Inch Hollow Stem Auger | Weather: | Clear Skies, Partly Sunny 60°F |
| Development Company: | Kayenta Consulting | | Slight Breeze |
| Date Development Started: | 10/17/02 | Date Development Completed: | 10/17/02 |
| Screen Intervals:<br>19 ft. to 24 ft bgs | | Well Diameter: | 2 Inch |
| Depth of Well ($L^w$): | 24 ft. | Depth to Water Before Development ($L^t$): | 19 ft. |
| Height of Water Column ($L^w$ - $L^t$): | 5 ft. | | |
| Depth to Top of Sediment ($L^s$) | 24 ft. | Sediment Thickness ($L^w$ - $L^s$): | Na ft. |
| Well Volume: | 0.8 gal. | | |
| Total Volume Pumped: | 35 gal. | | |
| Number of Well Volumes Pumped | (total volume pumped/well volume): | 43+ volumes purged on 10/17/02 | 0.16 gallons per foot on a 2-Inch Well |

## Monitoring Well Sample Data : Well RLP-GW7

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/17/02 | 15.5 | 6.51 | 1679 | 26 | Slightly turbid |
| 10/17/02 | 15.7 | 6.51 | 1719 | 35 | Clear |

* Sample collection continued after well development includes well development purge volumes

| | |
|---|---|
| 10/17/02 @ 1550 | Sample Collected |

## Lithology

| | |
|---|---|
| 0-24 feet bgs | Waste rock / river cobble |

| | | | |
|---|---|---|---|
| **Presented By** | **Date** | **Checked By** | **Date** |

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4300 Cherry Creek Drive South
Denver, CO 80246

# WELL DEVELOPMENT DATA AND SAMPLE FORM SUMMARY

Records Management Data

Project Number: Rico Light Industrial Park
Project Name: Rico Light Industrial Park
Well Number: RLP-GW8
Well Location: Rico Light Industrial Park

Time / Date: 10/17/02
Elevation : 8,800 msl
Drilling Method: 4-Inch Hollow Stem Auger
Weather: Clear Skies, Partly Sunny 60°F
Development Company: Kayenta Consulting
Slight Breeze
Date Development Started: 10/17/02
Date Development Completed: 10/17/02
Screen Intervals: 25 ft. to 30 ft bgs
Well Diameter: 2 Inch

Depth of Well ($L^{*}$): 30 ft.
Depth to Water Before Development ($L^{t}$): 25 ft.
Height of Water Column ($L^{*}$ - $L^{t}$): 5 ft.
Depth to Top of Sediment ($L^{j}$) 30 ft.
Sediment Thickness ($L^{*}$ - $L^{j}$): Na ft.
Well Volume: 0.8 gal.
Total Volume Pumped: 24 gal.
Number of Well Volumes Pumped (total volume pumped/well volume): 24+ volumes purged on 10/17/02
0.16 gallons per foot on a 2-Inch Well

## Monitoring Well Sample Data : Well RLP-GW8

| Date | Temp | pH | Cond | Gallons Purged | Observations |
|---|---|---|---|---|---|
| 10/17/02 | 13.0 | 6.46 | 2510 | 22 | Clear, Slightly turbid |
| 10/17/02 | 12.9 | 6.58 | 2520 | 23 | Clear, Slightly turbid |
| 10/17/02 | 12.5 | 6.64 | 2520 | 24 | Clear, Slightly turbid |

* Sample collection continued after well development includes well development purge volumes

10/17/02 @ 1735 Sample Collected

## Lithology

| | |
|---|---|
| 0-1 feet bgs | Fill material |
| 1-24 feet bgs | Red purple slimes, roasted tailings, saturated |
| 24 – 30 feet bgs | Native materials, river cobble |

| | | | |
|---|---|---|---|
| **Presented By** | **Date** | **Checked By** | **Date** |

# BORING B-1

SURFACE ELEVATION 8833
COORDINATES

| OTHER TESTS | STRENGTH TEST RESULTS | | | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS | | | SAMPLING | | DEPTH IN FEET | SAMPLING | SYMBOLS | DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) | | | | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE | | | | | |
| | | | | | | | | | | | | 0 | | | BROWN FINE TO COARSE SANDY GRAVEL WITH SILT MEDIUM DENSE | FILL |
| | | | | | | | | | | 18 | SPT | 5 | ◪ | | GRADES WITH LENSES OF SILTY SAND AND SANDY SILT | |
| | | | | | | | | | | 9 | SPT | 10 | ◪ | GM | COLORS GREY AND GRADES WITH SOME CLAY<br>GRADES LOOSE TO MEDIUM DENSE | |
| | | | | | | | | | | 7 | SPT | 15 | ◪ | | GRADES LOOSE | |
| | | | | 14 | | | | | | 13 | SPT | 20 | ◪ | | GRADES WITH MORE GRAVEL AND MEDIUM DENSE | |
| | | | | | | | | | | | | | | GM | DARK BROWN TO BLACK SILTY GRAVEL WITH SAND, MEDIUM DENSE | |
| | | | | | | | | | | 28 | D | 25 | ☒ | | | |
| | | | | | | | | | | 21 | SPT | 30 | ◪ | SM | BROWN SILTY FINE TO COARSE SAND WITH SOME GRAVEL, MEDIUM DENSE | |
| | | | | | | | | | | 50/5* | SPT | | ◪ | GM | BROWN SANDY GRAVEL, DENSE TO VERY DENSE<br>AUGER REFUSAL AT 33 FEET<br>BORING COMPLETED AT 33.5 FEET ON 6/3/81<br>WATER ENCOUNTERED AT 21.8 FEET ON 6/3/81 | |
| | | | | | | | | | | | | 35 | | | | |
| | | | | | | | | | | | | 40 | | | | |
| | | | | | | | | | | | | 45 | | | | |
| | | | | | | | | | | | | 50 | | | | |
| | | | | | | | | | | | | 55 | | | | |
| | | | | | | | | | | | | 60 | | | | |
| | | | | | | | | | | | | 65 | | | | |
| | | | | | | | | | | | | 70 | | | | |

KEY

■ INDICATES UNDISTURBED SAMPLE
☒ INDICATES DISTURBED SAMPLE
☐ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
◪ INDICATES STANDARD PENETRATION TEST SAMPLE
P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

U - DAMES & MOORE "U" BIT
T - DAMES & MOORE THIN-WALL
P - DAMES & MOORE PISTON
SPT - STANDARD SPLIT-SPOON
D - DAMES & MOORE "D" SAMPLER

NOTE:

1. THE SOIL CONDITIONS ARE DESCRIBED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM, PLATE A-3.
2. BLOW COUNT HAS BEEN TAKEN AS THE NUMBER OF BLOWS REQUIRED TO DRIVE A SAMPLER TO ONE-FOOT PENETRATION USING A 140 POUND WEIGHT FALLING 30 INCHES.

FILE ANACONDA RICO 04010-002-1408

# LOG OF BORING

DAMES & MOORE

PLATE A-1A

# BORING B-2

SURFACE ELEVATION 8834
COORDINATES

| OTHER TESTS | STRENGTH TEST RESULTS: TYPE OF TEST | CONFINING PRESSURE (psf) | PEAKSHEAR STRENGTH (psf) | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LL (%) | PL (%) | PI (%) | SAMPLING: BLOW COUNT | SAMPLE TYPE | DEPTH IN FEET | SAMPLING | SYMBOLS | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0 | | SC | BROWN CLAYEY SAND WITH GRAVEL MEDIUM DENSE |
| | | | | | | | | | | 26 | SPT | 5 | ☑ | SM | BROWN AND GREY GRAVELLY SAND WITH SOME CLAY |
| GRADATION | | | | 22 | | | 32 | 17 | 15 | 8 | SPT | 10 | ☑ | SC | YELLOW AND BROWN FINE TO COARSE CLAYEY SAND WITH GRAVEL LOOSE |
| | | | | | | | | | | 12 | SPT | 15 | ☑ | | LUMBER FRAGMENTS AT 15 FEET GRADES MEDIUM DENSE |
| | | | | | | | | | | 21 | SPT | 20 | ☑ | GM | GREY & BROWN SANDY GRAVEL WITH SOME SILT MEDIUM DENSE |
| | | | | | | 67<br>56 | 67 | 51 | 16 | 5<br>11 | SPT<br>SPT | 25 | ☑ | MH | DARK BROWN AND BLACK FINE SANDY SILT SOFT TO MEDIUM STIFF |
| | | | | | | | | | | 50 for 1/4" | SPT | 30 | ☑ | | AUGER REFUSAL AT 30.5 FEET<br>BORING COMPLETED AT 30.5 FEET ON 6/4/81<br>WATER ENCOUNTERED AT 20.7 FEET ON 6/3/81 |
| | | | | | | | | | | | | 35 | | | |
| | | | | | | | | | | | | 40 | | | |
| | | | | | | | | | | | | 45 | | | |
| | | | | | | | | | | | | 50 | | | |
| | | | | | | | | | | | | 55 | | | |
| | | | | | | | | | | | | 60 | | | |
| | | | | | | | | | | | | 65 | | | |
| | | | | | | | | | | | | 70 | | | |

FILL

**KEY**

- ■ INDICATES UNDISTURBED SAMPLE
- ☒ INDICATES DISTURBED SAMPLE
- ☐ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ☑ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

**SAMPLE TYPE**

U - DAMES & MOORE "U" BIT
T - DAMES & MOORE THIN-WALL
P - DAMES & MOORE PISTON
SPT - STANDARD SPLIT-SPOON
D - DAMES & MOORE "D" SAMPLER

NOTE:
SEE PLATE A - 1A.

# LOG OF BORING

**DAMES & MOORE**

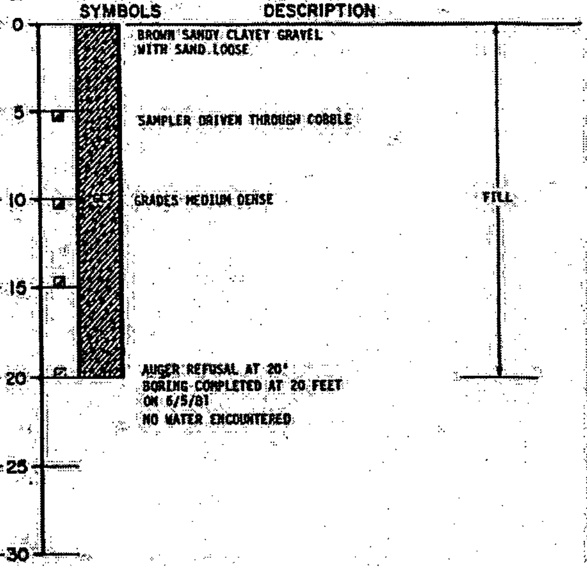
FILE ANACONDA RICO 04010-062-1608

FILE ANACONDA RICO 04010-082-1605

| OTHER TESTS | STRENGTH TEST RESULTS |  |  | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS |  |  | SAMPLING |  | DEPTH IN FEET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) |  |  |  | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  |  |  | 42 |  |  |  |  |  | 6 | SPT | 5 |
|  |  |  |  |  |  |  |  |  |  | 32 | SPT | 10 |
|  |  |  |  |  |  |  |  |  |  | 7<br>23 | SPT<br>SPT | 15 |
|  |  |  |  |  |  |  |  |  |  |  |  | 20 |
|  |  |  |  |  |  |  |  |  |  |  |  | 25 |
|  |  |  |  |  |  |  |  |  |  |  |  | 30 |

# BORING B-3

SURFACE ELEVATION 8836
COORDINATES



BROWN SANDY CLAYEY GRAVEL WITH SAND LOOSE

SAMPLER DRIVEN THROUGH COBBLE

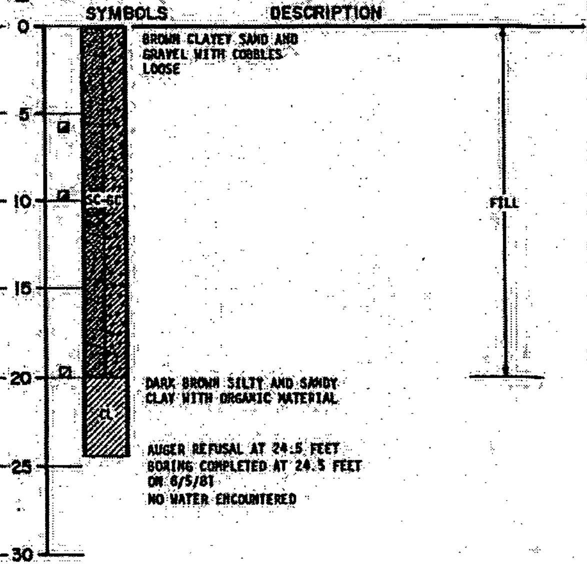
GRADES MEDIUM DENSE

AUGER REFUSAL AT 20'
BORING COMPLETED AT 20 FEET ON 6/5/81
NO WATER ENCOUNTERED

| OTHER TESTS | STRENGTH TEST RESULTS |  |  | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS |  |  | SAMPLING |  | DEPTH IN FEET |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) |  |  |  | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 0 |
| GRADATION |  |  |  | 22 |  | 15 | 27 | 21 | 6 | 8<br>5 | SPT<br>SPT | 5 |
|  |  |  |  |  |  |  |  |  |  |  |  | 10 |
|  |  |  |  |  |  |  |  |  |  | 1 | SPT | 15 |
|  |  |  |  |  |  |  |  |  |  |  |  | 20 |
|  |  |  |  |  |  |  |  |  |  |  |  | 25 |
|  |  |  |  |  |  |  |  |  |  |  |  | 30 |

# BORING B-4

SURFACE ELEVATION 8835
COORDINATES



BROWN CLAYEY SAND AND GRAVEL WITH COBBLES LOOSE

DARK BROWN SILTY AND SANDY CLAY WITH ORGANIC MATERIAL

AUGER REFUSAL AT 24.5 FEET
BORING COMPLETED AT 24.5 FEET ON 6/5/81
NO WATER ENCOUNTERED

KEY

■ INDICATES UNDISTURBED SAMPLE
☒ INDICATES DISTURBED SAMPLE
☐ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
◪ INDICATES STANDARD PENETRATION TEST SAMPLE
P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

U - DAMES & MOORE "U" BIT
T - DAMES & MOORE THIN-WALL
P - DAMES & MOORE PISTON
SPT - STANDARD SPLIT-SPOON
D - DAMES & MOORE "D" SAMPLER

NOTE:
SEE PLATE A - 1A.

# LOG OF BORING

DAMES & MOORE

PLATE A-1C

FILE ANACONDA RICO 04010-062 1005

## BORING B-5

SURFACE ELEVATION 8839
COORDINATES

| OTHER TESTS | STRENGTH TEST RESULTS | | | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS | | | SAMPLING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) | | | | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE |
| pH, SULFATES | | | | | | 5 | 31 | 20 | 11 | 11 | SPT |
| | | | | | | | | | | 11 | SPT |
| | | | | | | | | | | 32 | SPT |
| | | | | 43 | | | | | | 11 | SPT |
| | | | | | | 13 | 44 | 23 | 21 | 38 | SPT |
| | | | | | | | | | | 50 for 4 1/2" | SPT |

DEPTH IN FEET 0 5 10 15 20 25 30 35

SAMPLING

SYMBOLS DESCRIPTION

BROWN SANDY CLAY WITH SOME GRAVEL STIFF

GRADES WITH MORE GRAVEL

YELLOW-BROWN GRAVELLY SAND WITH SOME CLAY AND WOOD FRAGMENTS LOOSE TO MEDIUM DENSE

DARK BROWN SANDY CLAY

AUGER REFUSAL AT 29.5 FEET
WEATHERED SANDSTONE BEDROCK
BORING COMPLETED AT 30.25 FEET ON 6/6/81
WATER ENCOUNTERED AT 25.5 FEET ON 6/6/81

FILL

## BORING B-6

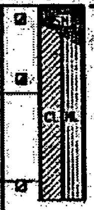
SURFACE ELEVATION 8793
COORDINATES

| OTHER TESTS | STRENGTH TEST RESULTS | | | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS | | | SAMPLING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) | | | | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE |
| | | | | | | | | | | 2/4" | SPT |
| | | | | 25 | | | 28 | 19 | 7 | 5 | SPT |
| | | | | | | | | | | 50/0" | SPT |

DEPTH IN FEET 0 5 10 15 20 25

SAMPLING

SYMBOLS DESCRIPTION



DARK BROWN SILTY SAND WITH GRAVEL AND COBBLES MEDIUM DENSE

DARK BROWN CLAYEY SILT AND SILTY CLAY WITH GRAVEL AND COBBLES MEDIUM STIFF

AUGER REFUSAL AT 10 FEET
BORING COMPLETED AT 11 FEET ON 6/7/81
WATER ENCOUNTERED AT 5 FEET ON 6/7/81

KEY

- ■ INDICATES UNDISTURBED SAMPLE
- ☒ INDICATES DISTURBED SAMPLE
- ☐ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ◪ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

U - DAMES & MOORE "U" BIT
T - DAMES & MOORE THIN-WALL
P - DAMES & MOORE PISTON
SPT - STANDARD SPLIT-SPOON
D - DAMES & MOORE "D" SAMPLER

NOTE:
SEE PLATE A - 1A.

# LOG OF BORING

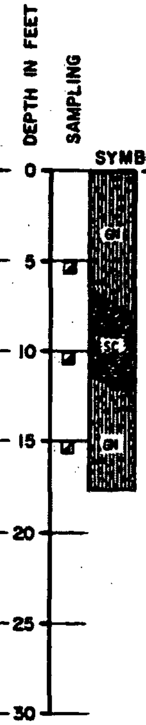
DAMES & MOORE

PLATE A-1D

# BORING B-7

SURFACE ELEVATION 8808
COORDINATES

| OTHER TESTS | STRENGTH TEST RESULTS | | | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS | | | SAMPLING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) | | | | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE |
| | | | | | | | | | | | |
| | | | | | | | | | | 7 | SPT |
| | | | | | | | | | | 9 | SPT |
| | | | | | | | | | | 33 | SPT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |



SYMBOLS DESCRIPTION

BROWN AND GREY SANDY GRAVEL WITH SOME SILT LOOSE

BROWN CLAYEY SAND WITH GRAVEL LOOSE TO MEDIUM DENSE

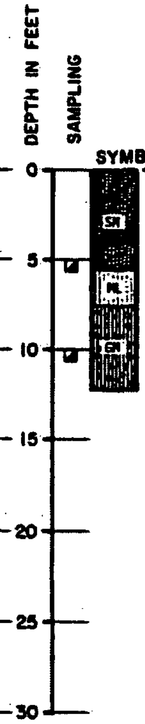
BROWN SANDY GRAVEL WITH SILT MEDIUM DENSE TO DENSE

AUGER REFUSAL AT 17.5 FEET
BORING COMPLETED AT 17.5 FEET ON 6/7/81
WATER LEVEL ENCOUNTERED AT 15 FEET

# BORING B-8

SURFACE ELEVATION 8814
COORDINATES

| OTHER TESTS | STRENGTH TEST RESULTS | | | % PASSING NO. 200 SIEVE | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS | | | SAMPLING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TYPE OF TEST | CONFINING PRESSURE (psf) | PEAK SHEAR STRENGTH (psf) | | | | LL (%) | PL (%) | PI (%) | BLOW COUNT | SAMPLE TYPE |
| | | | | | | | | | | | |
| | | | | | | | | | | 2 | SPT |
| GRADATION | | | | 10 | | | | | | 25/6" | SPT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |



SYMBOLS DESCRIPTION

BROWN SILTY FINE TO COARSE SAND WITH SOME GRAVEL LOOSE TO MEDIUM DENSE

DARK BROWN CLAYEY SILT WITH SAND

BROWN SANDY FINE GRAVEL WITH CLAY

AUGER REFUSAL AT 12 FEET
BORING COMPLETED AT 12 FEET ON 6/7/81
WATER LEVEL ENCOUNTERED AT 9 FEET ON 6/7/81

KEY

- ■ INDICATES UNDISTURBED SAMPLE
- ☒ INDICATES DISTURBED SAMPLE
- ☐ INDICATES SAMPLING ATTEMPT WITH NO RECOVERY
- ◪ INDICATES STANDARD PENETRATION TEST SAMPLE
- P - IN BLOW COUNT COLUMN INDICATES SAMPLER HYDRAULICALLY PUSHED

SAMPLE TYPE

U - DAMES & MOORE "U" BIT
T - DAMES & MOORE THIN-WALL
P - DAMES & MOORE PISTON
SPT - STANDARD SPLIT-SPOON
D - DAMES & MOORE "D" SAMPLER

NOTE:
SEE PLATE A - 1A.

Added 2/19/07

# LOG OF BORING

DAMES & MOORE

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | | |
|---|---|---|---|
| PROJECT NAME: Rico, CO<br>PROJECT NO.: ST LOUIS POND | BORING NUMBER: TP-1 | | COORDINATES OR LOCATION: |
| LOGGED BY: CA<br>CHECKED BY: | SURFACE ELEVATION: | | GWL DEPTH 7.8 [✓ (ENCOUNTERED)]<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: PIT | FLUID USED: N/A | DATE STARTED: 10-10-08<br>DATE COMPLETED: 10-10-08 |
| CASING TYPE AND SIZE: N/A<br>SCREEN TYPE AND SIZE: N/A | | | FROM ______ A.G.S TO ______ B.G.S.<br>FROM ______ TO ______ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Gravel on surface w/ road base course | |
| 1.0 | | X | | | | Dark brown silty sand with gravel | |
| 1.5 | ① | | | | | | |
| 2.0 | 2-1 | | | | | | |
| 2.5 | | X | | | | Red tailings (calcine) with gravel and rock (2"-8") approx 20-25% rock | |
| 3.0 | ② | | | | | | |
| 3.5 | 3.4 | | | | | | |
| 4.0 | | X | | | | Dark brown clay silt with gravel and rock (2"-12") ~10-12% rock moist | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | ③ | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | 7.8' | | | | | caving at 7.0' due to rock fall | water encountered at 7.8' |

NOTES

TD= 7.8'

Pit Backfilled & Compacted

X = Sample Collected, Composite of Material

ANDERSON

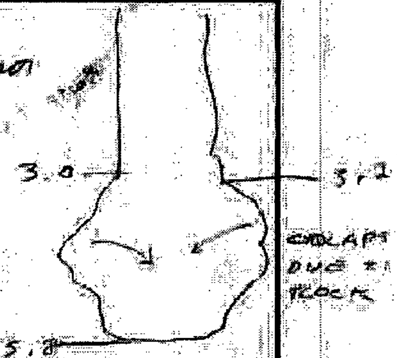
# BORING LOG

PAGE 1 OF 1

PROJECT NAME: Rico Co
PROJECT NO.: St. Louis Ponds
BORING NUMBER: TP-2
COORDINATES OR LOCATION:
LOGGED BY: CB
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH No water ~~(ENCOUNTERED)~~
GWL DEPTH (STATIC)
DRILLING METHOD: Backhoe Test Pit
HOLE DIAMETER: NA
FLUID USED: NA
DATE STARTED: 10-10-08
DATE COMPLETED: 10-10-08
CASING TYPE AND SIZE:
SCREEN TYPE AND SIZE: NA
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0.5 | | | | | | Gravel on surface |
| 1.0 | ① | | | | | Dark Brown, silty sand with minor gravel |
| 1.5 | | | | | | |
| 2.0 | 2.2 | | | | | |
| 2.5 | | | | | | Brown sandy silt soil with gravel and rock (2" to 14" ∅) moist, Rock ~10 to 12% |
| 3.0 | | | | | | |
| 3.5 | ② | | | | | |
| 4.0 | | | | | | |
| 4.5 | | | | | | |
| 5.0 | | | | | | |
| 5.5 | | | | | | Trench cave in on side walls |
| 6.0 | 5.8 | | | | | |

WELL CONSTRUCTION SUMMARY



No water encountered

NOTES

TD= 6.0

Did not continue due to cave in of side wall in trench

X - Sample, Backfilled & Compacted

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico CO<br>PROJECT NO.: St Louis Ponds | BORING NUMBER: TP-3 | COORDINATES OR LOCATION: |
| LOGGED BY: CR<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH No water encountered (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Backhoe Test Pit<br>HOLE DIAMETER: NA<br>FLUID USED: NA | | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | | FROM ______ A.G.S TO ______ B.G.S.<br>FROM ______ TO ______ B.G.S. |

| | DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH, (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|---|
| Sample 1 | 0.5 | | X | | | | Surface gravel 3/4" | |
| | 1.0 | | | | | | Sandy silt, dark brown soil, | |
| | 1.5 | | | | | | minor amounts of gravel | |
| | 2.0 | 1.8 | | | | | | |
| Sample 2 | 2.5 | 2.8 | X | | | | Silty sand, redish brown, mixed soil & tailings (calcine) | |
| [illegible] | 3.0 | | X | | | | Sandy silt, brown with | |
| | 3.5 | | | | | | gravel, moist, some large | |
| | 4.0 | | | | | | rock (6"-12"ø) moist | |
| | 4.5 | | | | | | | |
| | 5.0 | | | | | | | |
| | 5.5 | | | | | | | |
| | 6.0 | | | | | | | |
| | 6.5 | | | | | | | |
| | 7.0 | | | | | | | |
| | 7.5 | | | | | | | |
| | 8.0 | 7.8 | | | | | | |

NOTES

TD= 7.8' No Water

TEST PIT BACKFILLED, COMPACTED

X = SAMPLE COLLECTED, COMPOSIT OF INTERVAL

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | | |
|---|---|---|---|
| PROJECT NAME: Rico CO<br>PROJECT NO.: St Louis Pond | BORING NUMBER: TP-4 | COORDINATES OR LOCATION: | |
| LOGGED BY: CA<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 7.8' [✓ (ENCOUNTERED)]<br>GWL DEPTH (STATIC) | |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: PIT | FLUID USED: NA | DATE STARTED: 10-10-08<br>DATE COMPLETED: 10-10-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Gravel on surface | |
| 1.0 | 0.7' | X | | | | Silty sand, Dark brown dry | minor amounts of tail |
| 1.5 | 1.5 | | | | | Sandy silt with minor gravel Light brown | |
| 2.0 | | X | | | | Clay Silt with minor sand Brown soil w/ gravel moist | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | 4.5' | | | | | | |
| 5.0 | | X | | | | Clay silt, with minor sand with gravel, Dark brown some tailings mixed in soil moist at top wet at 7.5 | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | 7.8' | | | | | | 7.8' WATER ENCOUNTE |

NOTES

TD= 7.8'

- Water
- Backfilled & compacted

X = Sample collected, Composited Material

Ls

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: Rico, Co
PROJECT NO.: St Louis Ponds
BORING NUMBER: TP 5
COORDINATES OR LOCATION:
LOGGED BY: CA
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH Ø No water (ENCOUNTERED)
GWL DEPTH (STATIC)
DRILLING METHOD: Backhoe Test Pit
HOLE DIAMETER: N/A
FLUID USED: N/A
DATE STARTED: 10-15-08
DATE COMPLETED: 10-15-08
CASING TYPE AND SIZE: N/A
SCREEN TYPE AND SIZE:
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | 0.2 | | | | | Gravel on surface, Dark brown soil cap - sandy silt yellow brown tails & mine waste with gravel and rock (2" - 6" Ø) 70% rock | |
| 1.0 | ① 1.1 | | | | | | |
| 1.5 | | | | | | Brown soil mixed with red calcine tailings silty sand containing gravel and rock (2" to 12") ~ 20-30% rock | |
| 2.0 | | | | | | | |
| 2.5 | ② | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | 3.6 | | | | | | |
| 4.0 | | | | | | Brown soil, silty sand mixed with calcine tailings, minor gravel and some rock (2-6") ~5% rock | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | ③ | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | 7.9 | | | | | | NO WATER ENCOUNTERED |

NOTES

TD= 7.9'

1) Test Pit Backfilled + Compacted

X- Sample Collected + Composit of Material

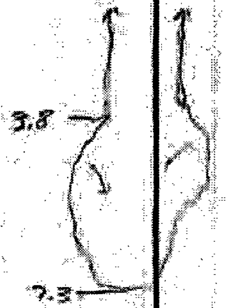
ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | | |
|---|---|---|---|
| PROJECT NAME: Rico Project<br>PROJECT NO.: St Louis Ponds | BORING NUMBER: TP-6 | | COORDINATES OR LOCATION: |
| LOGGED BY: Ea<br>CHECKED BY: | SURFACE ELEVATION: | | GWL DEPTH No water encountered (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: Pit | FLUID USED: NA | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| | DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|---|
| Sample 1 | 0.5 | ① | | | | | Gravel on surface<br>Dark grey soil with waste rock, gray in color (1" to 6") soil sandy, with gravel | |
| | 1.0 | | | | | | | |
| | 1.5 | | | | | | | |
| | 2.0 | 2' | | | | | | |
| Sample 2 | 2.5 | ② | | | | | Redish sandy tailings with gravel | |
| | 3.0 | | | | | | | |
| | 3.5 | | | | | | | |
| | 4.0 | 3.8 | | | | | | |
| Sample 3 | 4.5 | | | | | | Cream colored sandy tailings with gravel and rock (2" to 12")<br>Pyrite material mixed in this zone<br>NOTE: This layer was colapsing and under cutting when excavated | |
| | 5.0 | | | | | | | |
| | 5.5 | ③ | | | | | | |
| | 6.0 | | | | | | | |
| | 6.5 | | | | | | | |
| | 7.0 | 7.3 | | | | | | |
| | 7.5 | | | | | | | |
| | 8.0 | | | | | | | |



NOTES

TD= 7.3'

No water

Pit Backfilled and compacted

X - Sample Collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: RICO, CO<br>PROJECT NO.: ST LOUIS PONDS | BORING NUMBER: TP-7 | COORDINATES OR LOCATION: |
| LOGGED BY: CS<br>CHECKED BY: | SURFACE ELEVATION: | GW. DEPTH NO WATER ENCOUNTERED (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: NA<br>FLUID USED: NA | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | FROM ______ A.G.S TO ______ B.G.S.<br>FROM ______ TO ______ B.G.S. | |

| | DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|---|
| SAMPLE 1 | 0.5 | | | | | | TOP SURFACE GRAVEL | |
| | 1.0 | ① | | | | | BROWN SOIL - SILTY SAND | |
| | 1.5 | | | | | | WITH GRAVEL | |
| | 2.0 | | | | | | | |
| SAMPLE 2 | 2.5 | 2.4 | | | | | | |
| | 3.0 | ② | | | | | BROWN SOIL / TAILINGS | |
| | 3.5 | | | | | | SANDY SOIL w/SOME SILT MIXED WITH RED TAILINGS (CALCINE) | |
| SAMPLE 3 | 4.0 | ③ | | | | | TAILINGS, LIGHT BROWN TO CREAM IN COLOR, RED OXIDATION STAIN ON ROCK | |
| | 4.5 | | | | | | BROWN SOIL, SILTY SAND WITH GRAVEL, | |
| PLE | 5.0 | | | | | | | |
| | 5.5 | | | | | | LARGE ROCK ENCOUNTERED (12"-18") | |
| | 6.0 | ④ | | | | | w/ BROWN SOIL, SILTY SAND W/GRAVEL | |
| | 6.5 | | | | | | CONTAINS MINOR AMOUNT OF TAILINGS | |
| | 7.0 | | | | | | | |
| | 7.5 | 7.7 | | | | | | |
| | 8.0 | | | | | | | |

NOTES

TD= 7.7'

No Water Encountered
Pit Backfilled & Compacted
X = Sample Collected, Composite Material

ANDERSON

# BORING LOG

PAGE ____ OF ____

PROJECT NAME: Rico CO
PROJECT NO: St. Louis Ponds
BORING NUMBER: TP-8
COORDINATES OR LOCATION:
LOGGED BY: CS
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH: 0 No water (ENCOUNTERED)
GWL DEPTH: (STATIC)
DRILLING METHOD: Backhoe / Test Pit
HOLE DIAMETER: NA
FLUID USED: NA
DATE STARTED: 10-14-08
DATE COMPLETED: 10-14-08
CASING TYPE AND SIZE: Na
SCREEN TYPE AND SIZE:
FROM ____ A.G.S TO ____ B.G.S.
FROM ____ TO ____ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH, (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Brown sandy silt with gravel and cobbles, moist ~5% Rock | |
| 1.0 | | | | | | minor lenses of calcine tailings | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | Gray/white sandy gravel, several Boulders (≥12" Ø at this layer) Hard, stiff | 60% Rock |
| 3.0 | | | | | | Brown sandy silt with gravel and cobbles, moist ~5% rock | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

NOTES

TD= 6.0

1) Test Pit Backfilled + Compacted

X - Sample Collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico<br>PROJECT NO.: St Louis Ponds | BORING NUMBER: TP-9 | COORDINATES OR LOCATION: |
| LOGGED BY: CS<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 6.7' (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: NA / FLUID USED: NA | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| | DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|---|
| Sample 1 | 0.5 | 0 | X | | | | GRAVEL on SURFACE - Brown soil, silty sand with gravel and rock (2" to 14") | |
| | 1.0 | | | | | | | |
| | 1.5 | | | | | | | |
| | 2.0 | | | | | | | |
| | 2.5 | 1 | | | | | | |
| | 3.0 | | | | | | | |
| | 3.5 | | | | | | | |
| | 4.0 | | | | | | | |
| | 4.5 | 4.8' | | | | | | |
| Sample 2 | 5.0 | | X | | | | Brown soil with redish tailings silty sand with gravel and rock (2" to 16") mixed with tailings, interspersed clumps of tailings | water encounter @6.7' |
| | 5.5 | 2 | | | | | | |
| | 6.0 | | | | | | | |
| | 6.5 | 6.7 | | | | | | |
| | 7.0 | | | | | | | |

## NOTES

TD= 6.7'

TEST PIT BACKFILLED, COMPACTED

X = SAMPLE COLLECTED, COMPOSIT OF INTERVAL

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: Rico<br>PROJECT NO.: ST LOUIS POND | BORING NUMBER: TP-10 | COORDINATES OR LOCATION: |
| LOGGED BY: CK<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 6.4' [✓ (ENCOUNTERED)]<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: PIT<br>FLUID USED: NA | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | | FROM ___ A.G.S TO ___ B.G.S.<br>FROM ___ TO ___ B.G.S. |

| | DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH' (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|---|
| Sample 1 | 0.5 | ① | X | | | | Gravel on surface<br>Brown silty sand with gravel some small rock | |
| | 1.0 | 1.2 | | | | | | |
| Sample 2 | 1.5 | | X | | | | Brown silty sand w/ gravel and rock (2" to 12") | |
| | 2.0 | | | | | | | |
| | 2.5 | | | | | | | |
| | 3.0 | 3.2' | | | | | | |
| | 3.5 | 3.5 | | | | | SOIL LAYER - Brown silty sand no gravel | |
| | 4.0 | ② | | | | | Brown silty sand with gravel and rock (2"-12") | |
| | 4.5 | | | | | | | |
| | 5.0 | | | | | | | |
| | 5.5 | | | | | | | |
| | 6.0 | | | | | | | |
| | 6.5 | 6.4 | | | | | | WATER ENCOUNTERED 6.4' |

NOTES

TD= 6.4'

PIT BACKFILLED & COMPACTED

X - SAMPLE Collected, Composit of material

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | | |
|---|---|---|---|
| PROJECT NAME: RICO<br>PROJECT NO.: ST LOUIS PONDS | BORING NUMBER: TP-11 | COORDINATES OR LOCATION: | |
| LOGGED BY: CS<br>CHECKED BY: | SURFACE ELEVATION: | G/WL DEPTH 4.2' (ENCOUNTERED) from surface<br>G/WL DEPTH (STATIC) | |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: PIT | FLUID USED: NA | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| DEPTH (ft) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | ① 0.6 | | | | | Light Brown sandy silt soil w/ 3/4" gravel | |
| 1.0 | ② 1.1 | | | | | Light Brown sandy silt soil w/ some gravel | geotextile liner at 1.0' |
| 1.5 | ③ | | | | | Brown silty sand and gravel | |
| 2.0 | | | | | | and rock (2" - 8") intermixed | |
| 2.5 | 2.5 | | | | | Tails (cream to red) [illegible] present | |
| 3.0 | 3.0 | | | | | Layer of tailings | |
| 3.5 | ④ | | | | | Brown clay sand silt with gravel | |
| 4.0 | | | | | | and rock (2" to 12") intermixed | water [illegible] at 4' |
| 4.5 | | | | | | Tails (light brown/ cream to red) | |
| 5.0 | 5.0 | | | | | | |

NOTES

TD= 5.0'

PIT BACKFILLED & COMPACTED

X = SAMPLE Collected, Composit of Material

ANDERSON

# BORING LOG

TEST PIT

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: RICO<br>PROJECT NO.: ST LOUIS PONDS | BORING NUMBER: TP12 | COORDINATES OR LOCATION: |
| LOGGED BY: C.S.<br>CHECKED BY: | SURFACE ELEVATION: NA | GWL DEPTH 3.4' (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE, TEST PIT | HOLE DIAMETER: PIT<br>FLUID USED: NA | DATE STARTED: 10-9-08<br>DATE COMPLETED: 10-9-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH (FT) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | ① | X | | | | BROWNIN COLOR - SOIL | |
| 1.0 | 1.0 | | | | | SILTY SAND WITH GRAVEL | |
| 1.5 | ② | X | | | | BROWN SOIL - sandy silt | |
| 2.0 | 2.0 | | | | | WITH GRAVEL & ROCK (2" TO 8" ⌀) | |
| 2.5 | ③ | X | | | | BROWN SOIL sandy silt | |
| 3.0 | 3.0 | | | | | WITH GRAVEL & ROCK, SOIL WET | |
| 3.5 | ④ | X | | | | BROWN SOIL, silty sand | WATER AT 3.4' |
| 4.0 | 4.0 | | | | | W/ SOME CLAY, GRAVEL & ROCK | ENCOUNTERED |
| | | | | | | SOIL SATURATED | |

NOTES

TD= 4.0'

PIT BACKFILLED & COMPACTED

X - SAMPLE COLLECTED, COMPOSIT OF MATERIAL

ANDERSON

# BORING LOG

PAGE ____ OF ____

| | | |
|---|---|---|
| PROJECT NAME: Rico CO<br>PROJECT NO: St. Louis Ponds | BORING NUMBER: TP- 13 | COORDINATES OR LOCATION: |
| LOGGED BY: KC<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH: 0 No water ~~(ENCOUNTERED)~~<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Backhoe Test Pit | HOLE DIAMETER: NA / FLUID USED: NA | DATE STARTED: 10-14-08<br>DATE COMPLETED: 10-14-08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Gravel Surface | |
| 1.0 | | | | | | Gray Sandy Silt and gravel, stiff | |
| 1.5 | | | | | | Brown silty sand and gravel | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | Gray Sandy Silt and gravel, stiff | |
| 3.5 | | | | | | Red calcine tailings | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | | | | | | | |

NOTES

TD= 8.0

1) Test Pit Back-filled + compacted

x - Sample collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: Rico, Co
PROJECT NO.: St Louis Ponds
BORING NUMBER: TP-14
COORDINATES OR LOCATION:
LOGGED BY:
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH 0 No water (ENCOUNTERED)
GWL DEPTH (STATIC)
DRILLING METHOD: BACKHOE TEST PIT
HOLE DIAMETER: PIT
FLUID USED: N/A
DATE STARTED: 10-10-08
DATE COMPLETED: 10-10-08
CASING TYPE AND SIZE: N/A
SCREEN TYPE AND SIZE:
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | 0.3 | | | | | Gravel / upper course | |
| 1.0 | X | | | | | Red to dark red tailings (calcine) mixed with stained rock & tailings (cream colored) Rock mixed in tailings (2"-14") ~10% rock sandy to silty sand, moist | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | 8.0 | | | | | | no water |

NOTES

TD= 8.0'

NO WATER
BACKFILLED & COMPACTED
X = SAMPLE collected, Composit of Material

ANDERSON

# BORING LOG

PAGE ____ OF ____

|  |  |  |
|---|---|---|
| PROJECT NAME: Rico CO<br>PROJECT NO.: St Louis Ponds | BORING NUMBER: TP-15 | COORDINATES OR LOCATION: |
| LOGGED BY: CA<br>CHECKED BY: | SURFACE ELEVATION: – | GWL DEPTH 0 (no water (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Back hoe Test Pit<br>HOLE DIAMETER: NA<br>FLUID USED: NA | | DATE STARTED: 10-13-08<br>DATE COMPLETED: 10-13-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | X | | | | Light Brown soil, silty Clay with some sand, Lrg rock (2"–32") ~35–40% rock | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | ① | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | 6.2 | | | | | | no water encountered |
| 6.5 | | | | | | Large rock difficult to dig | |
| 7.0 | | | | | | | |

NOTES

TD= 6.2 1) TP 15 and 16 similar soil profiles

2) Test Pit Backfilled + Compacted

X - Sample collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: RICO, CO
PROJECT NO.: ST LOUIS PONDS
BORING NUMBER: TP-16
COORDINATES OR LOCATION:
LOGGED BY:
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH 0 No water (ENCOUNTERED)
GWL DEPTH (STATIC)
DRILLING METHOD: BACKHOE TEST PIT
HOLE DIAMETER: PIT
FLUID USED: NA
DATE STARTED: 10-13-08
DATE COMPLETED: 10-13-08
CASING TYPE AND SIZE: NA
SCREEN TYPE AND SIZE:
FROM ______ A.G.S TO ______ B.G.S.
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Gravel on surface | |
| 1.0 | | | | | | Light Brown soil, silty clay | |
| 1.5 | | | | | | with some sand, large | |
| 2.0 | | | | | | rock (2" to ~48") | |
| 2.5 | | | | | | ~30-35% Rock | |
| 3.0 | | | | | | | |
| 3.5 | ① | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | 5.4 | | | | | | No water encountered |
| 6.0 | | | | | | Large rock, very difficult excavation | |

NOTES

TD= 5.4' 1) TP-16 & TP-15 similar soil profiles
2) Test Pit Backfilled & Compacted
X - Sample collected & Composit of Material

ANDERSON

# BORING LOG

PAGE ____ OF ____

| | | |
|---|---|---|
| PROJECT NAME: Rico Co<br>PROJECT NO.: St. Louis Park | BORING NUMBER: TP-17 | COORDINATES OR LOCATION: |
| LOGGED BY: CK<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 0 No water ~~(ENCOUNTERED)~~<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Backhoe Test Pit | HOLE DIAMETER: NA<br>FLUID USED: NA | DATE STARTED: 10-13-08<br>DATE COMPLETED: 10-13-08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Gravel on surface, Brown sandy silt with some clay and gravel and Rock (2" to 14") Rock content 25% | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | 2.9 | | | | | | |
| 3.5 | | | | | | very dark, brown silty clay with organic material, little to no rock, soil moist | |
| 4.0 | 4.0 | | | | | | |
| 4.5 | | | | | | Brown silty clay with some large rock (6" - 14") ~5% soil moist | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | 6.4 | | | | | | |
| 6.5 | | | | | | | NO WATER ENCOUNTERED |
| 7.0 | | | | | | | |

NOTES

TD= ____

1) Test Pit Back filled & Compacted

2) Sample collected, Composit of Material

TP-17

ANDERSON

# BORING LOG

PAGE ____ OF ____

| | | |
|---|---|---|
| PROJECT NAME: Rico Co<br>PROJECT NO. St. Louis Ponds | BORING NUMBER: TP-18 | COORDINATES OR LOCATION: |
| LOGGED BY: RC<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 0 No water (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Backhoe Test Pit | HOLE DIAMETER: NA / FLUID USED: NA | DATE STARTED: 10-14-08<br>DATE COMPLETED: 10-14-08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Brown clayey silt with gravel and Cobble (3" - >12" Ø) ~10% rock moist | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

NOTES

TD= 7.0

1) Test Pit Backfilled & Compacted

2. Sample collected, Composit of Material

ANDERSON

# BORING LOG

PAGE ____ OF ____

| | | |
|---|---|---|
| PROJECT NAME: Rico Co<br>PROJECT NO.: St. Louis Pond | BORING NUMBER: TP-19 | COORDINATES OR LOCATION: |
| LOGGED BY: RC<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 0 No water (ENCOUNTERED)<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Backhoe Test Pit | HOLE DIAMETER: NA<br>FLUID USED: N/A | DATE STARTED: 10-13-08<br>DATE COMPLETED: 10-13-08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. NA | |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Brown clayey silt with gravel and rock (2" 12" [illegible]), moist 25-30% rock | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | 4.4 | | | | | | refusal |
| 5.0 | | | | | | Concrete foundation | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |

NOTES

TD= ________

1) Test Pit Back filled & Compacted

X) Sample Collected, Composit of Material

ANDERSON

# BORING LOG

PAGE ____ OF ____

| | | |
|---|---|---|
| PROJECT NAME: Rico CO<br>PROJECT NO.: St. Louis Ponds | BORING NUMBER: TP-20 | COORDINATES OR LOCATION: |
| LOGGED BY: KC<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH D None ~~(ENCOUNTERED)~~<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: Backhoe Test Pit<br>HOLE DIAMETER: NA<br>FLUID USED: NA | | DATE STARTED: 10-14-08<br>DATE COMPLETED: 10-14-08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | X | | | | Brown clayey silt with gravel and some Cobbles (6" - 12" Ø) 5-10% Rock | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | Lens of Red Calcine tailings @ 3' | |
| 3.5 | | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |

NOTES

TD= 7.5

Piece of Concrete foundation W. end of pit at 2' deep
metal debris found in zone containing the calcine tailings.
Test Pit Backfilled + Compacted
✓ Sample Collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: Rico Co
PROJECT NO.: St Louis Ponds
BORING NUMBER: TP 21
COORDINATES OR LOCATION:
LOGGED BY: KC
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH: 0 (ENCOUNTERED)
GWL DEPTH: no water (STATIC)
DRILLING METHOD: Backhoe Test Pit
HOLE DIAMETER: NA
FLUID USED: NA
DATE STARTED: 10-13-08
DATE COMPLETED: 10-13-08
CASING TYPE AND SIZE: NA
SCREEN TYPE AND SIZE:
FROM ____ A.G.S TO ____ B.G.S. NA
FROM ____ TO ____ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | | | | | Brown Silty sand and gravel | |
| 1.0 | ① | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | 2.0 | | | | | | |
| 2.5 | ② | | | | | White and yellow crushed rock Mine waste (3-6" ⊘) rock 60% rock | |
| 3.0 | 3.0 | | | | | | |
| 3.5 | | | | | | Brown Silty sand with gravel and cobbles 10-15 % rock | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | ③ | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | 7.0 | | | | | | |
| 7.5 | | | | | | TD ↑ | No water encountered |

NOTES

TD= 7.0

1) Test Pit Backfilled + Compacted

*) Sample collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

PROJECT NAME: Rico, Co
PROJECT NO: St Louis Ponds
BORING NUMBER: TP-22
COORDINATES OR LOCATION:
LOGGED BY: KC/CS
CHECKED BY:
SURFACE ELEVATION:
GWL DEPTH no water (ENCOUNTERED)
GWL DEPTH (STATIC)
DRILLING METHOD: Back hoe Test Pit
HOLE DIAMETER: NA
FLUID USED: NA
DATE STARTED: 10-13-08
DATE COMPLETED: 10-13-08
CASING TYPE AND SIZE:
SCREEN TYPE AND SIZE: NA
FROM ______ A.G.S TO ______ B.G.S. NA
FROM ______ TO ______ B.G.S.

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | 1 | X | | | | Crushed stone and solidified Red sandy tailings - calcine | |
| 1.0 | 1.0 | | | | | | |
| 1.5 | 2 | X | | | | Orange silty sand with gravel & cobbles - mine waste | |
| 2.0 | 2.0 | | | | | | |
| 2.5 | | X | | | | Brown silty sand with gravel and cobbles | |
| 3.0 | | | | | | | |
| 3.5 | 3 | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | 5.0 | | | | | | Large rocks, could not remove - refusal<br>No water encountered |
| 5.5 | | | | | | TD ↑ | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |

NOTES

TD= 5.0

1) Steel pipe in trench, running N/S at 1.2' deep. Pipe 9" Ø
2) Test Pit Back filled + Compacted
x - Sample collected, Composite of Material

91~48'196

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME Rico, CO<br>PROJECT NO. ST LOUIS PONDS | BORING NUMBER: TP-23 | COORDINATES OR LOCATION: |
| LOGGED BY: CA<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH 0, no water ~~(ENCOUNTERED)~~<br>GWL DEPTH (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT<br>HOLE DIAMETER: PIT<br>FLUID USED: NA | | DATE STARTED: 10-10-08<br>DATE COMPLETED: 10-10-08 |
| CASING TYPE AND SIZE:<br>SCREEN TYPE AND SIZE: NA | | FROM ___ A.G.S TO ___ B.G.S.<br>FROM ___ TO ___ B.G.S. |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | X | | | | Gravel on surface<br>Dark brown, silty sand with gravel | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | 2.8 | | | | | | |
| 3.5 | | X | | | | Red tailings (calcine) with rock (2" - 8") ~10% rock | |
| 4.0 | 3.9 | | | | | | |
| 4.5 | | X | | | | Brown soil, clay silt with minor sand, mixed with tailings (cream colored tails) contains gravel and rock (2" - 12") ~15-20% | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | 6.2 | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| | | | | | | Large rock at 6.2, could not dig pit - refusal | |

## NOTES

TD= 6.2'

No Water
Backfilled and Compacted
X = Sample collected, Composit of Material

ANDERSON

# BORING LOG

PAGE 1 OF 1

| | | |
|---|---|---|
| PROJECT NAME: RICO, CO<br>PROJECT NO: ST LOUIS PONDS | BORING NUMBER: TP-24 | COORDINATES OR LOCATION: |
| LOGGED BY: Cd<br>CHECKED BY: | SURFACE ELEVATION: | GWL DEPTH: 0 No water (ENCOUNTERED)<br>GWL DEPTH: (STATIC) |
| DRILLING METHOD: BACKHOE TEST PIT | HOLE DIAMETER: NA<br>FLUID USED: NA | DATE STARTED: 10-10-08<br>DATE COMPLETED: 10-10-08 |
| CASING TYPE AND SIZE: NA<br>SCREEN TYPE AND SIZE: | FROM ____ A.G.S TO ____ B.G.S.<br>FROM ____ TO ____ B.G.S. | |

| DEPTH ( ) | SAMPLE TYPE AND NUMBER | SAMPLE DEPTH INTERVAL | BLOW COUNT | RECOVERY LENGTH (%) | PROFILE | DESCRIPTION | WELL CONSTRUCTION SUMMARY |
|---|---|---|---|---|---|---|---|
| 0.5 | | X | | | | Red Tailings - silty sand with some rock (2"-8") less than 5% rock (cobble) | |
| 1.0 | | | | | | | |
| 1.5 | | | | | | | |
| 2.0 | | | | | | | |
| 2.5 | | | | | | | |
| 3.0 | | | | | | | |
| 3.5 | ① | | | | | | |
| 4.0 | | | | | | | |
| 4.5 | | | | | | | |
| 5.0 | | | | | | | |
| 5.5 | | | | | | | |
| 6.0 | | | | | | | |
| 6.5 | | | | | | | |
| 7.0 | | | | | | | |
| 7.5 | | | | | | | |
| 8.0 | 7.9 | | | | | | No water |

NOTES

TD= 7.9'

Backfilled and Compacted

X = Sample collected, Composite of Material

TP-24

SEH 2004

TP-2004A

10:00 AM EXCAVATE TP-2004A
0'- 10.5' CAT 436B RUBBTIRE BACKHOE
COLLUVIUM, CLAYEY SAND AND
GRAVEL, DARK REDDISH GRAY
(3/1), BOULDERS TO 2.0',
MOIST, MODERATELY DENSE
BOULDERS AND COBBLES
SUBROUNDED TO ANGULAR,
ESTIMATE 30% > 2"

TP-2004B

TP-2004 B
0 - 7.0' COLLUVIUM
, CLAYEY SAND AND GRAVEL
BROWN (4/3), MOIST, MOD
DENSE, LOW PLASTISITY
FINES, BOULDERS TO 1.0',
COBBLES AND BOULDERS
ANGULAR, TO SUBANGULAR
ESTIMATE 20% > 2"

TP-2004C

TP-2004 C
0 - 9.0' COLLUVIUM
CLAYEY SAND AND GRAVEL
DARK BROWN (3/2), SLIGHTLY
MOIST, FINES LOW TO MOD
PLASTICITY, BOULDERS TO 3.0'
ESTIMATE 15% > 2". COBBLES
ANGULAR TO SUBANGULAR

TP-2004 D

0.0-1.5', TOPSOIL
1.5-6.0' COLLUVIUM
SILTY GRAVELLY SAND,
DARK REDDISH BROWN (3/4),
SLIGHTLY MOIST, LOOSE,
BOULDERS TO 1.0'; SUBROUNDED
TO SUB ANGULAR. ESTIMATE
5-10% > 2"

TP-2004D

---

TP-2004 E
N. OF POND 18 IN CALCINE
TAILINGS
0'-9.0' Calcine Tailings
9.0-12.0' RIVER COBBLES
WATER @ 8.0'

TP-2004E

---

TP-2004 F
EAST OF POND 18
0-0.5' FILL
0.5-12.0' CALCINE TAILINGS

TP-2004F

---

TP-2004 G
EAST OF POND 18
0-0.5 FILL
0.5-12.0' Calcine tailings

TP-2004G

TP-2004 H
POND 16/17
0-4.0' FILL
4.0'-12.0' Calcine tailing
GW@ 11.0'

TP-2004 H

TP-2004 I
POND 16-17
0-12.0' Calcine Tailings
~~GW~~ GW@ 12.0'

3 SAMPLES EACH PIT

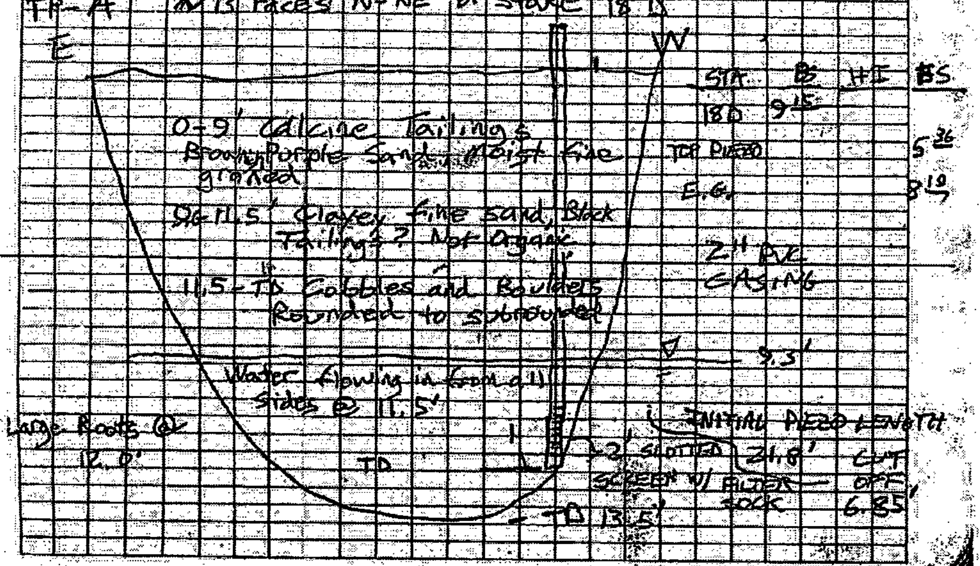
TP-2004 I

SEH 2001

TP-A

2:33 PM

TP-A ~13 Paces N-NE of Stake 18 D



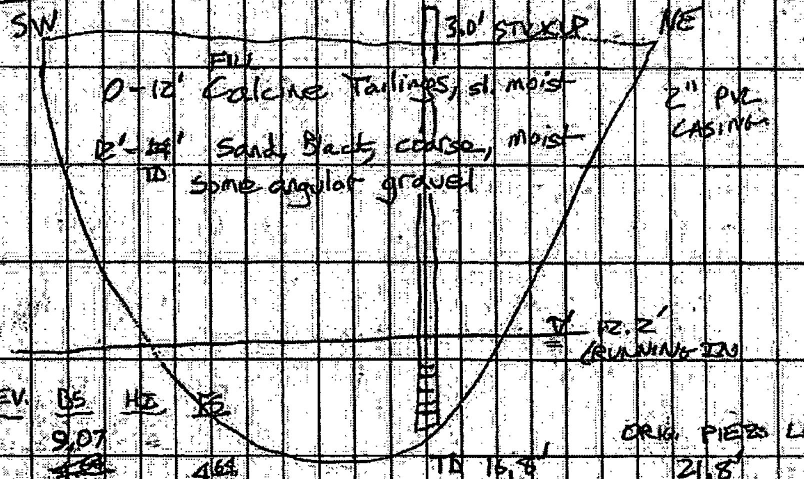
| STA | BS | HI | FS |
|---|---|---|---|
| 18D | 9.15 | | |
| TOP PIEZO | | | 5.36 |
| E.G. | | | 8.10 |

INITIAL PIEZO LENGTH 21.8'

CUT OFF 6.85'

TP-B

3:40 PM TP-B JUST WEST OF SW CORNER TEST CELL #9



| STA | ELEV. | BS | HI | FS |
|---|---|---|---|---|
| 18-J | | 9.07 | | |
| TOP CASING | | ~~[illegible]~~ | | 4.64 |
| Ex. GND | | | | |

ORIG. PIEZO LENGTH 21.8'

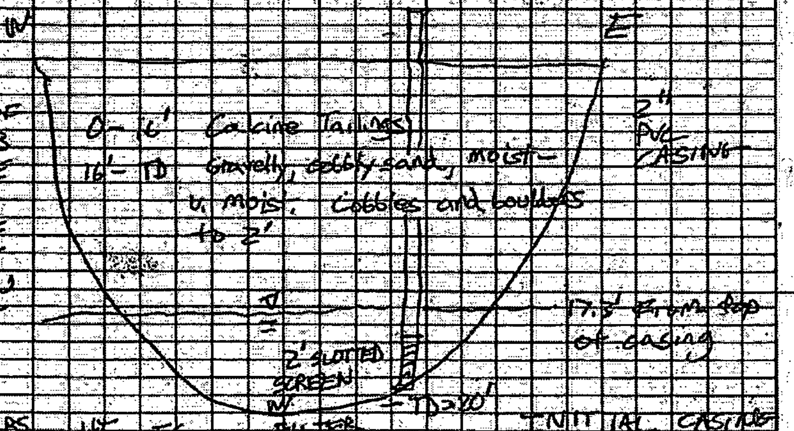
CUT OFF 1.75'

TP-C

4:10 PM

TP-C

54' YARDS
DUE EAST OF
18-6 HUB
NEAR EDGE
OF ROAD
~~~5' N OF~~
~20' S. OF
LINE THRU
18-A, 18-6



| STA | ELEV | BS | HI | FS |
|---|---|---|---|---|
| 18-6 | | 3.57 | | |
| TOP CASING | | | | 2.50 |
| Ex. GND | | | | 5.90 |

INITIAL CASING LENGTH 28.3'

CUT OFF 5.13'
~~~

**ANDERSON Engineering Company, Inc.**
975 West 2100 South, Suite 100
Salt Lake City, Utah 84119
BUS (801) 972-6222
FAX (801) 972-6235

SAMPLING METHOD: BACKHOE PIT

LOGGED BY: JOEL MARTINEAU

# ARCO
# RICO RECLAMATION
# BORROW MATERIAL

BORING NO. APB-1
SHEET 1 OF 1
DATE STARTED: 10 APR 96
DATE COMPLETE: 10 APR 96
TOTAL DEPTH: 3.0
SURFACE ELEV: 8895
N 26680 * Y: E. 20135

| SAMPLE NO. | SAMPLE DEPTH (ft) | DEPTH (ft) | SYMBOL | USC | DESCRIPTION |
|---|---|---|---|---|---|
| | | 0 | | | SURFACE HAS ROCKS EXPOSED |
| APB-1 | | | | SC-CL<br>OH<br>-GW | 0-0.7 Root ZONE Soil GRAYISH Brown<br>SANDY-clay to clay w/ ORGANIC MATERIAL<br>AND Minor GRAVEL TO 1CM SIZE. Some Large Rock<br>Sizes, Scattered. |
| | | 1 | | | |
| | 0-3' | | | | 0.7 - 3.0 FT<br>Brown Soil w/ Isolated Sub-rounded rock<br>Texture SC-CL. EST 5% Rock > 3".<br>Rock Fragments To 4 CM, Subangular. |
| | | 2 | | | |
| | | 3 | | | |

**ANDERSON Engineering Company, Inc.**
975 West 2100 South, Suite 100
Salt Lake City, Utah 84119
BUS (801) 972-6222
FAX (801) 972-6235

SAMPLING METHOD: BACKHOE

LOGGED BY: J. MARTINEAU

# ARCO

# RICO RECLAMATION

# BORROW MATERIAL

BORING NO. APB-2
SHEET 1 OF 1
DATE STARTED: 10 APR 1996
DATE COMPLETE: 10 APR 1996
TOTAL DEPTH: 3.0'
SURFACE ELEV: 8853
N 26710 E 19940

| SAMPLE NO. | SAMPLE DEPTH (ft) | DEPTH (ft) | SYMBOL | USC | DESCRIPTION |
|---|---|---|---|---|---|
| APB-2 | 0-3' | 0 |  | SM-CL<br>+<br>GW | 0-1.0' Root ZONE No NOTICABLE ORGANICS<br>Color Reddish-BROWN TO yellow-BROWN<br>(Limonitic + Hematitic)<br>FINES SANDY Silt AND clay<br>Rocks Mostly Sub-angular |
| | | 1<br>2<br>3 | | SM-CL<br>+<br>GW | 1.0' - 3.0' SIMILAR TO ABOVE<br>LARGER Rock INCREASING Percentage<br>Largest size 1.5 x 1.2 x 1.7<br>Two others OVER 1' Screen SIZE |

ANDERSON Engineering Company, Inc.
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BUS (801) 972-6222
FAX (801) 972-6235

SAMPLING METHOD: Backhoe

LOGGED BY: J. MARTINELL

ARCO

RICO RECLAMATION

BORROW MATERIAL

BORING NO. APB-3
SHEET 1 OF 1
DATE STARTED: 10 APR 96
DATE COMPLETE: 10 APR 96
TOTAL DEPTH: 3.0
SURFACE ELEV: 8836
N 26400 E 20000

| SAMPLE NO. | SAMPLE DEPTH (ft) | DEPTH (ft) | SYMBOL | USC | DESCRIPTION |
|---|---|---|---|---|---|
| APB-3 | | 0 |  | GW-SC-CL | NO NOTICABLE ORGANIC HORIZON |
| | | 1 | | | BROWN Soil-Rock Mixture Subangular Rock - consistent gradation from Top to Bottom. (GROUND FROZEN TO 2.5 Ft) |
| | 0-3' | | | | |
| | | 2 | | | |
| | | | | | Bottom 3" water |
| | | 3 | | | |

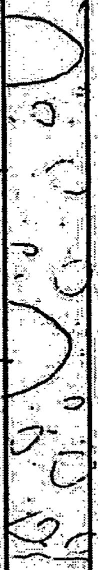
**ANDERSON Engineering Company, Inc.**
975 West 2100 South, Suite 100
Salt Lake City, Utah 84119
BUS (801) 972-6222
FAX (801) 972-8235

SAMPLING METHOD: BACKHOE
VISUAL ONLY

LOGGED BY: J MARTINEAU

# ARCO
# RICO RECLAMATION
# BORROW MATERIAL

BORING NO. PPB-4
SHEET 1 OF 1
DATE STARTED: 10 APR 96
DATE COMPLETE: 10 APR 96
TOTAL DEPTH: 3.0 ft
SURFACE ELEV: 8828
~~X:~~ E ~~Y:~~ N
19,870 26475

| SAMPLE NO. | SAMPLE DEPTH (ft) | DEPTH (ft) | SYMBOL | USC | DESCRIPTION |
|---|---|---|---|---|---|
| | | 0 |  | | Water level - Site is in River-Gravels |
| NONE Taken<br>VISUAL ONLY | N/A | 1<br>2<br>3 | | GW-GP | mostly sand & gravel. No Soil Horizons<br>Fines About 45-50%<br>3-12" Rock 45%<br>>12" 3-5%<br>This Material consists mostly of Rounded Rock & River Gravel, SANDY FINES |

# APPENDIX A2
# GEOTECHNICAL LABORATORY RESULTS

# 2011 Laboratory Data

**Western Technologies Inc.**
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# LABORATORY REPORT

Date of Report 11-18-11
Job No. 3151JM098
Event / Invoice No. 31510186-60 Lab No. 0981118
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-2011
Submitted By D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location ADF-R1
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 10 | 16.2 | | | |
| 13 | 49.4 | | | |
| 17 | 46.4 | NV | NV | NP |
| 22 | 11.7 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

Copies To: CLIENT (2)

REVIEWED BY

**Western Technologies Inc.**
The Quality People
Since 1955

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-61 Lab No. 0981116-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ADF-R1, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

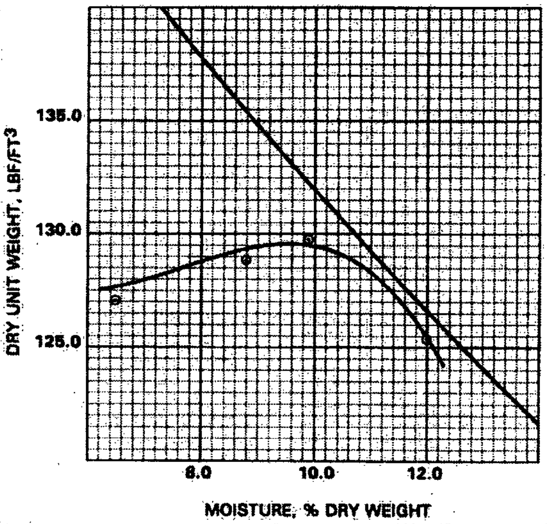
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | 100 | |
| 1 | 99 | |
| 3/4 | 88 | |
| 1/2 | 76 | |
| 3/8 | 69 | |
| 1/4 | 59 | |
| No.4 | 53 | |
| 8 | 45 | |
| 10 | 43 | |
| 16 | 38 | |
| 30 | 33 | |
| 40 | 31 | |
| 50 | 28 | |
| 100 | 23 | |
| 200 | 19 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 26
MAXIMUM DENSITY, LBF/FT$^3$ → 129.6
OPTIMUM MOISTURE CONTENT, % → 9.5

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.68

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| pH DETERMINATION :<br>pH → | | |
| SOLUBLE SALTS :<br>PPM → | | |
| MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION :
GROUP SYMBOL:
NAME:

Comments :

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# LABORATORY REPORT

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-40 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location ADF-R2
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 2 | 13.8 | | | |
| 6 | 10.9 | | | |
| 12 | 9.0 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-41 Lab No. 0981114-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ADF-R2 @12'
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 59 | |
| 1 1/2 | 52 | |
| 1 | 46 | |
| 3/4 | 41 | |
| 1/2 | 36 | |
| 3/8 | 33 | |
| 1/4 | 30 | |
| No.4 | 27 | |
| 8 | 22 | |
| 10 | 21 | |
| 16 | 17 | |
| 30 | 13 | |
| 40 | 12 | |
| 50 | 11 | |
| 100 | 9 | |
| 200 | 7.2 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | | |
| FINE AGGREGATE UNIT WEIGHT, KG/M$^3$ → | | |
| VOIDS, % → | | |
| COARSE AGGREGATE UNIT WEIGHT, KG/M$^3$ → | | |
| VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | | |
| BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | | |
| BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | | |
| GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | | |
| GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | | |
| FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | | |
| FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | | |
| ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | | |
| $D_c$ → | | |
| $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD VC, % → | | |

Comments :

Copies to : CLIENT (1)

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-16 Lab No. 0981031-1
Authorized by CHRIS SANCHEZ Date 10-31-11
Sampled by CLIENT Date 10-31-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-1, 1' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-31-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 92 | |
| 1 1/2 | 88 | |
| 1 | 83 | |
| 3/4 | 74 | |
| 1/2 | 68 | |
| 3/8 | 65 | |
| 1/4 | 59 | |
| No.4 | 56 | |
| 8 | 50 | |
| 10 | 49 | |
| 16 | 44 | |
| 30 | 40 | |
| 40 | 37 | |
| 50 | 34 | |
| 100 | 28 | |
| 200 | 23 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE<br>FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| FINE AGGREGATE VOIDS, % → | | |
| COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| COARSE AGGREGATE VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO<br>BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO<br>BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96<br>GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535<br>GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113<br>FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112<br>FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA<br>ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE<br>$D_c$ → | | |
| $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD VC, % → | | |

Comments :

Copies to : CLIENT (1)

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

REVIEWED BY

**Western Technologies Inc.**
The Quality People
Since 1955

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# LABORATORY REPORT

| | | | |
|---|---|---|---|
| Date of Report | 11-09-11 | | |
| Job No. | 3151JM098 | | |
| Event / Invoice No. | 31510186-15 | Lab No. | |
| Authorized By | C. SANCHEZ | Date | 10-21-11 |
| Sampled By | CLIENT | Date | 10-21-11 |
| Submitted By | D. SENJEM | Date | 10-31-11 |

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location ED-1
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 7.8 | | | |
| 4 | 10.4 | | | |
| 12 | 13.6 | NV | NV | NP |
| 20 | 11.3 | NV | NV | NP |
| 26 | 22.8 | | | |
| 31 | 22.0 | | | |
| 36 | 25.3 | NV | NV | NP |
| 41 | 24.4 | | | |
| 46 | 22.1 | | | |
| 51 | 24.3 | | | |
| 56 | 23.8 | | | |
| 61 | 24.0 | NV | NV | NP |
| 71 | 25.3 | NV | NV | NP |
| 76 | 26.9 | | | |
| 91 | NA | NV | NV | NP |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

Copies To: CLIENT (2)

REVIEWED BY ______________________

**Western Technologies Inc.**
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-17-11
Job No. 3151JM098
Event / Invoice No. 31510186-20
Lab No. 098103115

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-2, 0-4' ELEVATION
Testing Authorized :
Special Instructions :

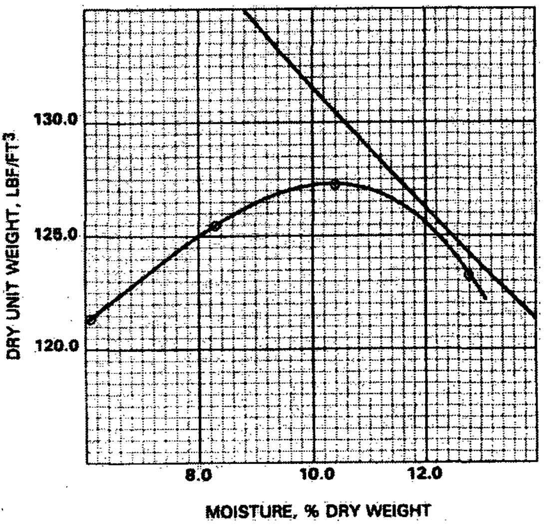
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 87 | |
| 3 | 78 | |
| 2 | 73 | |
| 1 1/2 | 69 | |
| 1 | 66 | |
| 3/4 | 63 | |
| 1/2 | 59 | |
| 3/8 | 55 | |
| 1/4 | 50 | |
| No.4 | 46 | |
| 8 | 42 | |
| 10 | 41 | |
| 16 | 37 | |
| 30 | 33 | |
| 40 | 31 | |
| 50 | 28 | |
| 100 | 24 | |
| 200 | 21 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 11
MAXIMUM DENSITY, LBF/FT$^3$ → 127.3
OPTIMUM MOISTURE CONTENT, % → 10.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 35

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.67

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 138.5
CORR. OPTIMUM MOISTURE, % 7.0

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| ***EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :*** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION :
GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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(970) 375-9033 • fax: 375-9034

# LABORATORY REPORT

| | | | |
|---|---|---|---|
| Date of Report | 11-09-11 | | |
| Job No. | 3151JM098 | | |
| Event / Invoice No. | 31510186-17 | Lab No. | |
| Authorized By | C. SANCHEZ | Date | 10-21-11 |
| Sampled By | CLIENT | Date | 10-21-11 |
| Submitted By | D. SENJEM | Date | 10-31-11 |

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location ED-2
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 4.6 | 23 | NV | NP |
| 6 | 12.9 | 23 | NV | NP |
| 11 | 17.0 | | | |
| 16 | 15.6 | | | |
| 21 | 19.1 | NV | NV | NP |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-18 Lab No. 098103116
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-2, 6' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 88 | |
| 1 1/2 | 81 | |
| 1 | 65 | |
| 3/4 | 60 | |
| 1/2 | 53 | |
| 3/8 | 49 | |
| 1/4 | 44 | |
| No.4 | 42 | |
| 8 | 37 | |
| 10 | 36 | |
| 16 | 33 | |
| 30 | 31 | |
| 40 | 29 | |
| 50 | 26 | |
| 100 | 21 | |
| 200 | 15 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS ☐ ASTM C125 → | | |
| ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-19 Lab No. 098103119
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-2, 21' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | 100 | |
| 3/4 | 93 | |
| 1/2 | 91 | |
| 3/8 | 90 | |
| 1/4 | 89 | |
| No.4 | 88 | |
| 8 | 86 | |
| 10 | 85 | |
| 16 | 83 | |
| 30 | 81 | |
| 40 | 81 | |
| 50 | 80 | |
| 100 | 73 | |
| 200 | 52 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| RESISTANCE TO DEGRADATION — LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-11-11
Job No. 3151JM098
Event / Invoice No. 31510186-20 Lab No. 098103115
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-2, 0-4' ELEVATION
Testing Authorized :
Special Instructions :

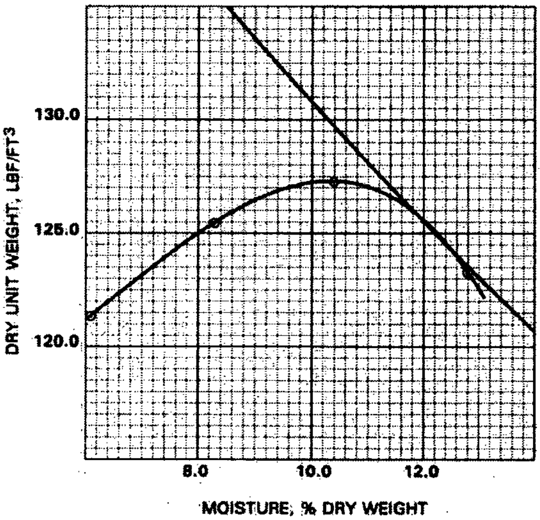
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 87 | |
| 3 | 78 | |
| 2 | 73 | |
| 1 1/2 | 69 | |
| 1 | 66 | |
| 3/4 | 63 | |
| 1/2 | 59 | |
| 3/8 | 55 | |
| 1/4 | 50 | |
| No.4 | 46 | |
| 8 | 42 | |
| 10 | 41 | |
| 16 | 37 | |
| 30 | 33 | |
| 40 | 31 | |
| 50 | 28 | |
| 100 | 24 | |
| 200 | 21 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 11
MAXIMUM DENSITY, LBF/FT$^3$ → 127.3
OPTIMUM MOISTURE CONTENT, % → 10.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 35

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 138.5
CORR. OPTIMUM MOISTURE, % 7.0

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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## LABORATORY REPORT

Date of Report 11-14-11
Job No. 3151JM098
Event / Invoice No. 31510186-23 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location ED-3
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 4 | 32.9 | 28 | NV | NP |
| 8 | 47.4 | 29 | NV | NP |
| 12 | 15.2 | NV | NV | NP |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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Durango, Colorado 81302
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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-16-11
Job No. 3151JM098
Event / Invoice No. 31510186-25 Lab No. 0981102-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-3, 12' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 94 | |
| 1 1/2 | 90 | |
| 1 | 76 | |
| 3/4 | 73 | |
| 1/2 | 68 | |
| 3/8 | 64 | |
| 1/4 | 61 | |
| No.4 | 59 | |
| 8 | 54 | |
| 10 | 54 | |
| 16 | 50 | |
| 30 | 46 | |
| 40 | 42 | |
| 50 | 38 | |
| 100 | 23 | |
| 200 | 11 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-24 Lab No. 0981102-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-3, 4-7.5' ELEVATION
Testing Authorized :
Special Instructions :

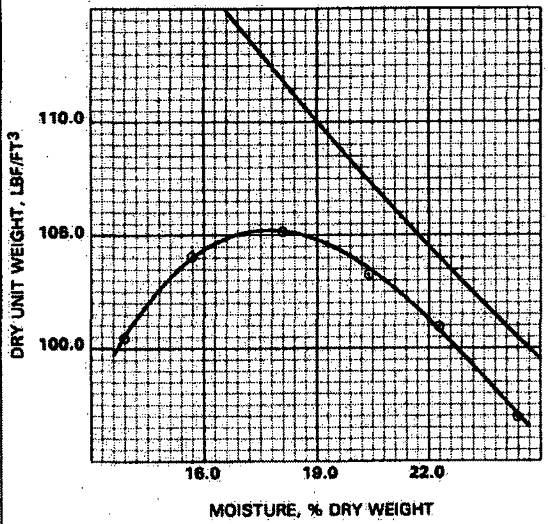
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | 100 | |
| 1 | 99 | |
| 3/4 | 99 | |
| 1/2 | 98 | |
| 3/8 | 97 | |
| 1/4 | 96 | |
| No.4 | 95 | |
| 8 | 92 | |
| 10 | 91 | |
| 16 | 84 | |
| 30 | 77 | |
| 40 | 74 | |
| 50 | 69 | |
| 100 | 57 | |
| 200 | 42 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 22
MAXIMUM DENSITY, LBF/FT$^3$ → 105.2
OPTIMUM MOISTURE CONTENT, % → 17.7

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# LABORATORY REPORT

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-35 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Location RICO, COLORADO
Contractor FLARE CONSTRUCTION
Arch. / Engr. ANDERSON ENGINEERING
Type / Use of Material VARIOUS
Supplier / Source BORINGS
Sample Source / Location ED-4
Source / Location Desig. By CLIENT Date 10-21-11
Reference: ASTM
Special Instructions:

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 6.4 | 24 | 18 | 6 |
| 6 | 9.7 | | | |
| 11 | 11.0 | | | |
| 16 | 11.0 | 24 | 17 | 7 |
| 21 | 12.9 | | | |
| 26 | 23.5 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-16-11
Job No. 3151JM098
Event / Invoice No. 31510186-37 Lab No. 0981102-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-4, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

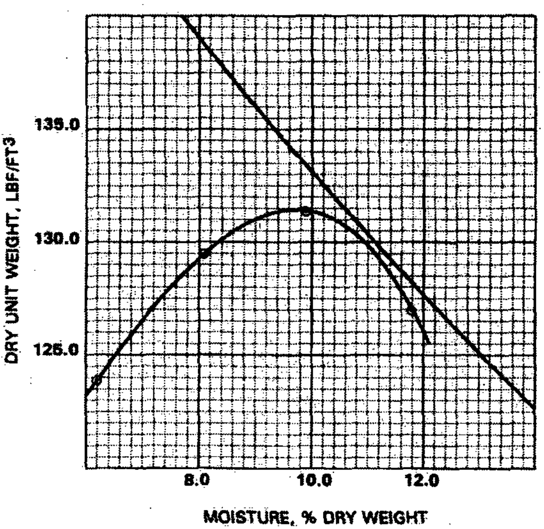
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | 100 | |
| 1 | 89 | |
| 3/4 | 83 | |
| 1/2 | 77 | |
| 3/8 | 73 | |
| 1/4 | 68 | |
| No.4 | 65 | |
| 8 | 58 | |
| 10 | 58 | |
| 16 | 53 | |
| 30 | 48 | |
| 40 | 45 | |
| 50 | 41 | |
| 100 | 35 | |
| 200 | 28 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 18
MAXIMUM DENSITY, LBF/FT$^3$ → 131.4
OPTIMUM MOISTURE CONTENT, % → 9.7

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 17

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.71

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH →<br>SOLUBLE SALTS :<br>PPM →<br>MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# LABORATORY REPORT

Date of Report 11-18-11
Job No. 3151JM098
Event / Invoice No. 31510186-45 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Location RICO, COLORADO
Contractor FLARE CONSTRUCTION
Arch. / Engr. ANDERSON ENGINEERING
Type / Use of Material VARIOUS
Supplier / Source BORINGS
Sample Source / Location ED-5
Source / Location Desig. By CLIENT Date 10-21-11
Reference: ASTM
Special Instructions:

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 0-5 | 11.3 | 27 | 19 | 8 |
| 7.5-12.5 | 13.0 | 28 | 19 | 9 |
| 14-20 | 120.6 | 20 | NV | NP |
| 25-30 | 19.1 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-46 Lab No. 0981111-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-5, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

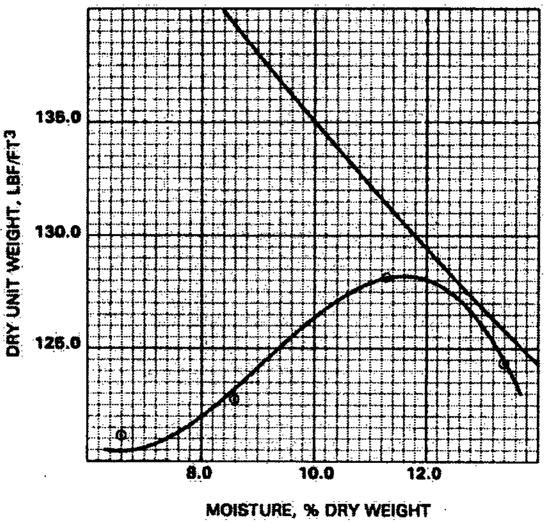
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 96 | |
| 2 | 88 | |
| 1 1/2 | 85 | |
| 1 | 75 | |
| 3/4 | 69 | |
| 1/2 | 64 | |
| 3/8 | 59 | |
| 1/4 | 54 | |
| No.4 | 51 | |
| 8 | 43 | |
| 10 | 43 | |
| 16 | 38 | |
| 30 | 34 | |
| 40 | 32 | |
| 50 | 29 | |
| 100 | 25 | |
| 200 | 21 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 19
MAXIMUM DENSITY, LBF/FT$^3$ → 128.2
OPTIMUM MOISTURE CONTENT, % → 11.6

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 31

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.76

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 137.8
CORR. OPTIMUM MOISTURE, % 8.3

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **pH DETERMINATION :**<br>pH →<br>**SOLUBLE SALTS :**<br>PPM →<br>**MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments : PERCENT OVERSIZE GREATER THAN ALLOWABLE BY ROCK CORRECTION METHOD.

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-47 Lab No. 0981111-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-5, 7.5'TO 12.5'ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | 100 | |
| 3 | 71 | |
| 2 | 67 | |
| 1 1/2 | 61 | |
| 1 | 54 | |
| 3/4 | 50 | |
| 1/2 | 44 | |
| 3/8 | 40 | |
| 1/4 | 36 | |
| No.4 | 33 | |
| 8 | 28 | |
| 10 | 27 | |
| 16 | 24 | |
| 30 | 21 | |
| 40 | 19 | |
| 50 | 18 | |
| 100 | 15 | |
| 200 | 12 | |

**LIQUID LIMIT & PLASTIC PROPERTIES**
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| **FINENESS MODULUS**<br>☐ ASTM C125 → | | |
| **ORGANIC IMPURITIES**<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| **CLEANNESS VALUE**<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| **UNIT WEIGHT & VOIDS**<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE | UNIT WEIGHT, $KG/M^3$ → | | |
| | | VOIDS, % → | | |
| | COARSE AGGREGATE | UNIT WEIGHT, $KG/M^3$ → | | |
| | | VOIDS, % → | | |
| **SPECIFIC GRAVITY & ABSORPTION** | FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| | COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| **SAND EQUIVALENT VALUE** | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| **RESISTANCE TO DEGRADATION** | SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | | GRADING 1000 REV., %LOSS → | | |
| **LIGHTWEIGHT PIECES**<br>☐ ASTM C123 ☐ AASHTO T113 | | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| **CLAY LUMPS & FRIABLE PARTICLES**<br>☐ ASTM C142 ☐ AASHTO T112 | | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| **FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT**<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| **DURABILITY INDEX**<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | | $D_c$ → | | |
| | | $D_f$ → | | |
| **UNCOMPACTED VOID CONTENT**<br>☐ AZ 247 ☐ ASTM C1252 | METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-48 Lab No. 0981111-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-5, 14-20' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | 100 | |
| 3 | 91 | |
| 2 | 84 | |
| 1 1/2 | 77 | |
| 1 | 68 | |
| 3/4 | 63 | |
| 1/2 | 56 | |
| 3/8 | 49 | |
| 1/4 | 43 | |
| No.4 | 39 | |
| 8 | 30 | |
| 10 | 29 | |
| 16 | 24 | |
| 30 | 19 | |
| 40 | 16 | |
| 50 | 14 | |
| 100 | 10 | |
| 200 | 7.6 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE<br>FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| VOIDS, % → | | |
| COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO<br>BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO<br>BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96<br>GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535<br>GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113<br>FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112<br>FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA<br>ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE<br>$D_c$ → | | |
| $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD VC, % → | | |

Comments :

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# LABORATORY REPORT

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-37
Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location ED-6
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 9.0 | 26 | 20 | 6 |
| 6 | 12.9 | 23 | 22 | 1 |
| 11 | 20.8 | | | |
| 16 | 28.1 | | | |
| 21 | 28.1 | | | |
| 26 | 31.6 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-38 Lab No. 0981112-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-6, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

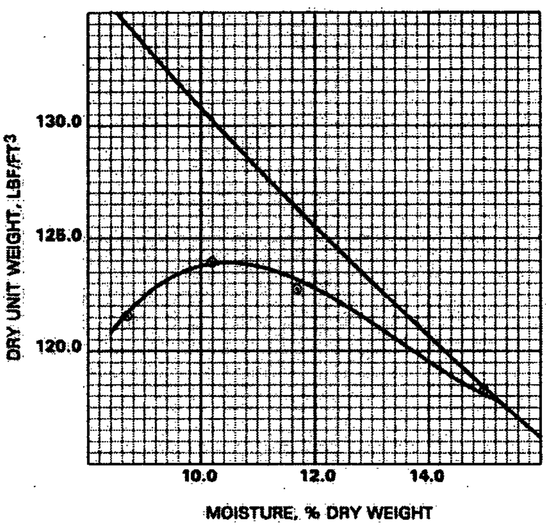
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | 100 | |
| 1 1/2 | 94 | |
| 1 | 89 | |
| 3/4 | 85 | |
| 1/2 | 77 | |
| 3/8 | 73 | |
| 1/4 | 66 | |
| No.4 | 63 | |
| 8 | 55 | |
| 10 | 53 | |
| 16 | 48 | |
| 30 | 43 | |
| 40 | 40 | |
| 50 | 37 | |
| 100 | 32 | |
| 200 | 27 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 21
MAXIMUM DENSITY, LBF/FT$^3$ → 123.9
OPTIMUM MOISTURE CONTENT, % → 10.5

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-39 Lab No. 0981112-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location ED-6, 15-20' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | 100 | |
| 8 | 99 | |
| 10 | 99 | |
| 16 | 99 | |
| 30 | 98 | |
| 40 | 97 | |
| 50 | 97 | |
| 100 | 85 | |
| 200 | 41 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS ☐ ASTM C125 → | | |
| ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| RESISTANCE TO DEGRADATION — LARGE COARSE AGGREGATE ☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# LABORATORY REPORT

| | | | |
|---|---|---|---|
| Date of Report | 11-15-11 | | |
| Job No. | 3151JM098 | | |
| Event / Invoice No. | 31510186-32 | Lab No. | |
| Authorized By | C. SANCHEZ | Date | 10-21-11 |
| Sampled By | CLIENT | Date | 10-21-11 |
| Submitted By | D. SENJEM | Date | 10-31-11 |

Client **ANDERSON ENGINEERING COMPANY, INC.**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **MW-1D**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-21-11**

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 9.8 | 23 | 20 | 3 |
| 6 | 17.4 | | | |
| 13 | 19.5 | 22 | 17 | 5 |
| 21 | 9.7 | | | |
| 26 | 7.8 | | | |

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.**

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-33 Lab No. 0981108-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-1D, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

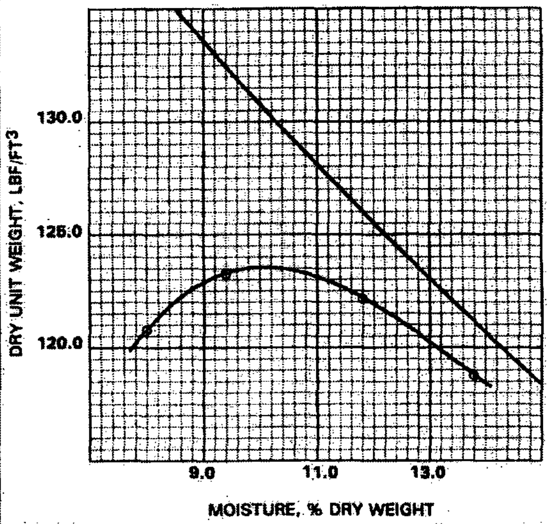
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | 100 | |
| 1 1/2 | 89 | |
| 1 | 82 | |
| 3/4 | 77 | |
| 1/2 | 69 | |
| 3/8 | 63 | |
| 1/4 | 56 | |
| No.4 | 52 | |
| 8 | 43 | |
| 10 | 41 | |
| 16 | 37 | |
| 30 | 32 | |
| 40 | 30 | |
| 50 | 28 | |
| 100 | 23 | |
| 200 | 18 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 25
MAXIMUM DENSITY, LBF/FT3 → 123.5
OPTIMUM MOISTURE CONTENT, % → 10.0

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 31

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 134.0
CORR. OPTIMUM MOISTURE, % 7.2

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| LIQUID LIMIT → | | | GRADING 100 REV. % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | | GRADING 500 REV. % LOSS → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | | | |
| **MOISTURE CONTENT :** | | | **SPECIFIC GRAVITY :** | | |
| PORTION TESTED % DRY WEIGHT → | | | MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | | **pH DETERMINATION :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | | pH → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | | **SOLUBLE SALTS :** | | |
| SURCHARGE, KSF | | | PPM → | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **MINIMUM RESISTIVITY :** | | |
| | | | OHM-CM → | | |

SOIL CLASSIFICATION :
GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 3151018-34 Lab No. 0981108-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-1D, 12.5-18.5' ELEVATION
Testing Authorized :
Special Instructions :

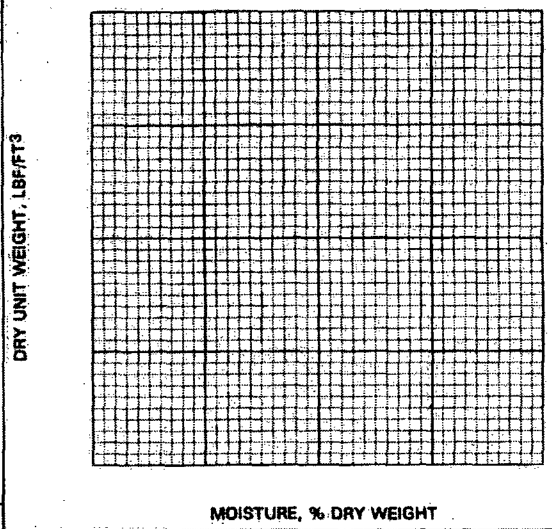
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 80 | |
| 2 | 74 | |
| 1 1/2 | 71 | |
| 1 | 68 | |
| 3/4 | 64 | |
| 1/2 | 59 | |
| 3/8 | 56 | |
| 1/4 | 50 | |
| No.4 | 46 | |
| 8 | 37 | |
| 10 | 35 | |
| 16 | 30 | |
| 30 | 25 | |
| 40 | 22 | |
| 50 | 20 | |
| 100 | 16 | |
| 200 | 13 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| pH DETERMINATION :<br>pH → | | |
| SOLUBLE SALTS :<br>PPM → | | |
| MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# LABORATORY REPORT

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-26
Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location MW-2D
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 7.9 | 25 | 23 | 2 |
| 6 | 9.6 | | | |
| 13 | 11.0 | | | |
| 18 | 9.2 | | | |
| 22 | 16.6 | NV | NV | NP |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-16-11
Job No. 3151JM098
Event / Invoice No. 31510186-27 Lab No. 0981107-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-2D, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

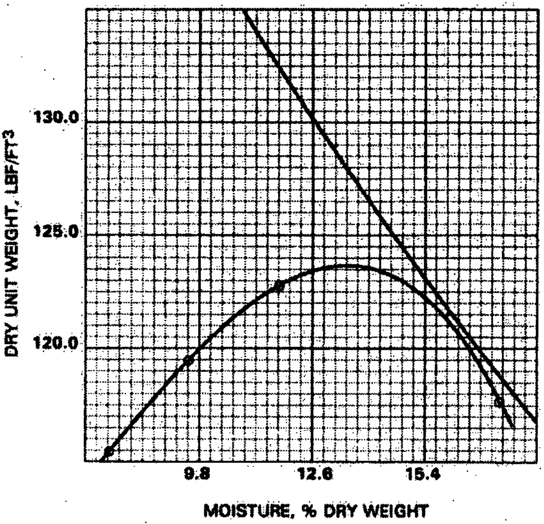
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 92 | |
| 1 1/2 | 88 | |
| 1 | 78 | |
| 3/4 | 73 | |
| 1/2 | 66 | |
| 3/8 | 62 | |
| 1/4 | 56 | |
| No.4 | 52 | |
| 8 | 44 | |
| 10 | 42 | |
| 16 | 37 | |
| 30 | 32 | |
| 40 | 30 | |
| 50 | 27 | |
| 100 | 22 | |
| 200 | 18 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 23
MAXIMUM DENSITY, LBF/FT$^3$ → 123.7
OPTIMUM MOISTURE CONTENT, % → 13.2

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.82

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION :
GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-28 Lab No. 0981107-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-2D, 10-15' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 91 | |
| 1 1/2 | 80 | |
| 1 | 67 | |
| 3/4 | 62 | |
| 1/2 | 51 | |
| 3/8 | 44 | |
| 1/4 | 37 | |
| No.4 | 33 | |
| 8 | 26 | |
| 10 | 25 | |
| 16 | 21 | |
| 30 | 16 | |
| 40 | 14 | |
| 50 | 13 | |
| 100 | 10 | |
| 200 | 7.2 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | | |
| FINE AGGREGATE UNIT WEIGHT, $KG/M^3$ → | | |
| VOIDS, % → | | |
| COARSE AGGREGATE UNIT WEIGHT, $KG/M^3$ → | | |
| VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | | |
| BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | | |
| BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | | |
| GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | | |
| GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | | |
| FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | | |
| FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | | |
| ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | | |
| $D_c$ → | | |
| $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD VC, % → | | |

Comments :

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# LABORATORY REPORT

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-29 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location MW-3D
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 9.5 | 26 | 16 | 11 |
| 6 | 10.6 | | | |
| 11 | 15.5 | | | |
| 16 | 12.8 | | | |
| 21 | 16.4 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR *GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY* RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-30 Lab No. 0981108-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-3D, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

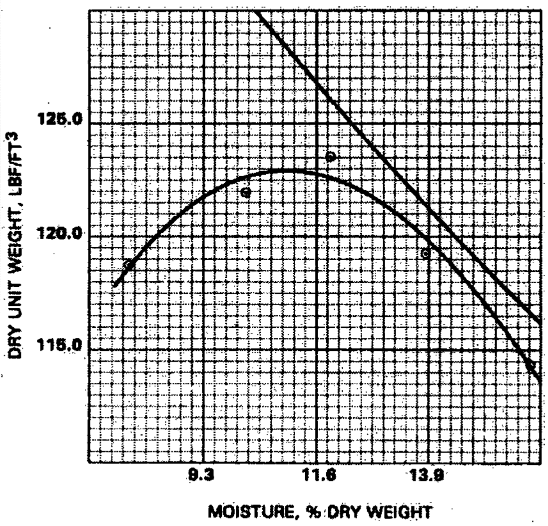
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM D1140

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 89 | |
| 1 1/2 | 69 | |
| 1 | 63 | |
| 3/4 | 58 | |
| 1/2 | 53 | |
| 3/8 | 50 | |
| 1/4 | 45 | |
| No.4 | 42 | |
| 8 | 39 | |
| 10 | 36 | |
| 16 | 33 | |
| 30 | 29 | |
| 40 | 27 | |
| 50 | 25 | |
| 100 | 22 | |
| 200 | 18 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 24
MAXIMUM DENSITY, LBF/FT³ → 122.9
OPTIMUM MOISTURE CONTENT, % → 10.8

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **pH DETERMINATION :**<br>pH →<br>**SOLUBLE SALTS :**<br>PPM →<br>**MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-16-11
Job No. 3151JM098
Event / Invoice No. 31510186-31 Lab No. 0981108-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-3D, 10-15' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 95 | |
| 1 1/2 | 88 | |
| 1 | 79 | |
| 3/4 | 71 | |
| 1/2 | 60 | |
| 3/8 | 55 | |
| 1/4 | 48 | |
| No.4 | 44 | |
| 8 | 35 | |
| 10 | 33 | |
| 16 | 28 | |
| 30 | 23 | |
| 40 | 20 | |
| 50 | 18 | |
| 100 | 14 | |
| 200 | 11 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

Copies to : CLIENT (1)

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# LABORATORY REPORT

|  |  |  |  |
|---|---|---|---|
| Date of Report | 12-01-11 |  |  |
| Job No. | 3151JM098 |  |  |
| Event / Invoice No. | 31510186-88 | Lab No. |  |
| Authorized By | C. SANCHEZ | Date | 10-21-11 |
| Sampled By | CLIENT | Date | 10-21-11 |
| Submitted By | D. SENJEM | Date | 10-31-11 |

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location MW-5D
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 7 | 28.2 |  |  |  |
| 17 | 60.0 | NV | NV | NP |
| 26 | 18.7 |  |  |  |
| 31 | 41.0 |  |  |  |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-02-11
Job No. 3151JM098
Event / Invoice No. 31510186-89 Lab No. 0981122-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-5D, 6-15' ELEVATION
Testing Authorized :
Special Instructions :

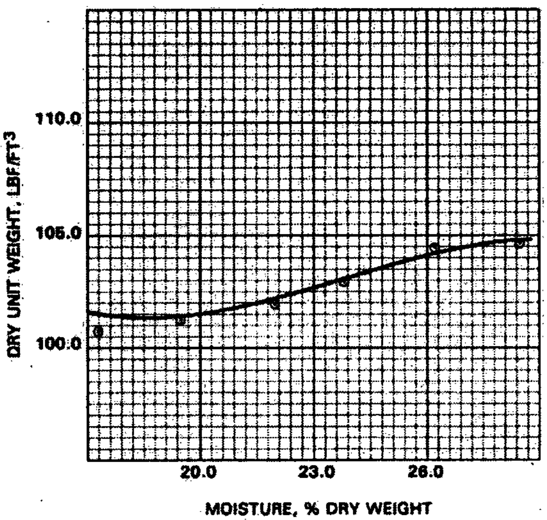
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | 100 | |
| 8 | 98 | |
| 10 | 97 | |
| 16 | 96 | |
| 30 | 95 | |
| 40 | 94 | |
| 50 | 92 | |
| 100 | 75 | |
| 200 | 38 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD A



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 31
MAXIMUM DENSITY, LBF/FT$^3$ → 104.8
OPTIMUM MOISTURE CONTENT, % → 28.5

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 4.48

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY : ASTM D854**<br>MAX. PARTICLE SIZE, IN. #4 SPECIFIC GRAVITY @ 20°C → | 4.48 | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **pH DETERMINATION :**<br>pH → | | |
| | | | **SOLUBLE SALTS :**<br>PPM → | | |
| | | | **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-02-11
Job No. 3151JM098
Event / Invoice No. 31510186-90 Lab No. 0981122-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-5D, 15-20' ELEVATION
Testing Authorized :
Special Instructions :

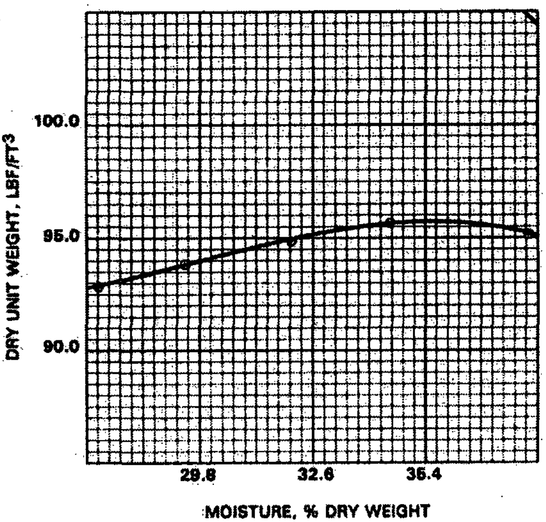
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | | |
| 16 | 100 | |
| 30 | 99 | |
| 40 | 99 | |
| 50 | 98 | |
| 100 | 94 | |
| 200 | 70 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD A



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 33
MAXIMUM DENSITY, LBF/FT$^3$ → 95.7
OPTIMUM MOISTURE CONTENT, % → 35.1

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 4.59

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY : ASTM D854** | | |
| MAX. PARTICLE SIZE, IN. #4 SPECIFIC GRAVITY @ 20°C → | 4.59 | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-02-11
Job No. 3151JM098
Event / Invoice No. 31510186-91 Lab No. 0981122-5
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-5D, 25-30' ELEVATION
Testing Authorized :
Special Instructions :

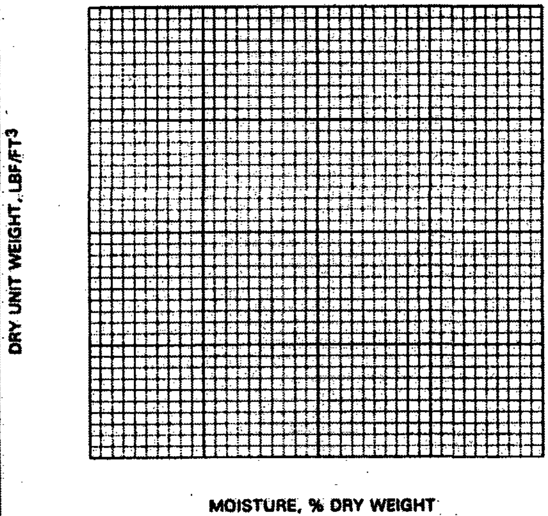
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 89 | |
| 1 1/2 | 83 | |
| 1 | 69 | |
| 3/4 | 60 | |
| 1/2 | 48 | |
| 3/8 | 41 | |
| 1/4 | 34 | |
| No.4 | 30 | |
| 8 | 24 | |
| 10 | 22 | |
| 16 | 20 | |
| 30 | 16 | |
| 40 | 15 | |
| 50 | 13 | |
| 100 | 11 | |
| 200 | 10 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-02-11
Job No. 3151JM098
Event / Invoice No. 31510186-92 Lab No. 0981122-6
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-5D, 30-35' ELEVATION
Testing Authorized :
Special Instructions :

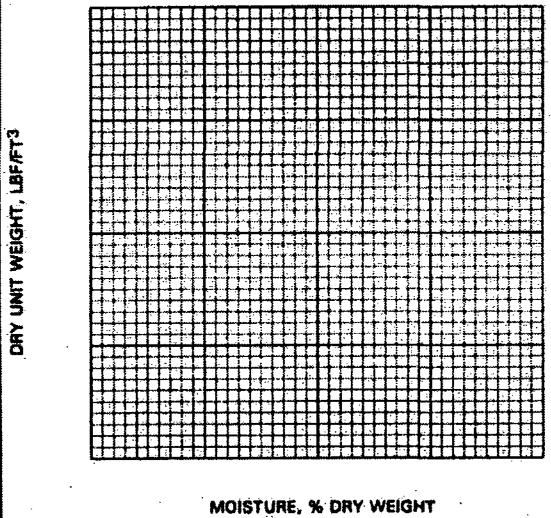
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 97 | |
| 2 | 84 | |
| 1 1/2 | 79 | |
| 1 | 68 | |
| 3/4 | 58 | |
| 1/2 | 47 | |
| 3/8 | 40 | |
| 1/4 | 32 | |
| No.4 | 28 | |
| 8 | 21 | |
| 10 | 20 | |
| 16 | 17 | |
| 30 | 15 | |
| 40 | 13 | |
| 50 | 12 | |
| 100 | 10 | |
| 200 | 6.9 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV. % LOSS →<br>GRADING 500 REV. % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION :
GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# LABORATORY REPORT

Date of Report 12-05-11
Job No. 3151JM098
Event / Invoice No. 31510186-100 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location MW-6D
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: | LL | PL | PI |
|---|---|---|---|---|---|
| 1 | 7.8 | | | | |
| 5 | 9.8 | | 26 | 20 | 6 |
| 10 | 9.1 | | | | |
| 14 | 6.0 | | | | |
| 18 | 26.4 | | 42 | 28 | 14 |
| 25 | 18.4 | | 22 | 18 | 4 |
| 33 | 24.1 | | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Date of Report **12-07-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-101** Lab No. **0981130-1**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIABLE**
Sample Source / Location **MW-6D, 0-3.5' ELEVATION**
Testing Authorized :
Special Instructions :

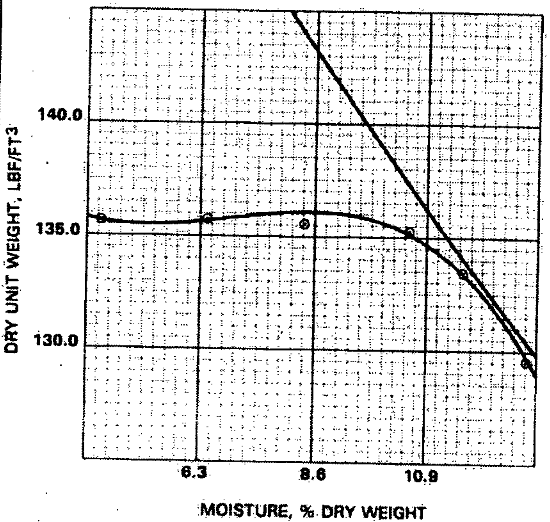
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORING**
Source / Location Desig. By **CLIENT** Date **10-21-11**

## TEST RESULTS

SIEVE ANALYSIS : **CP-31**
FINER THAN NO. 200 : **ASTM C117**

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 96 | |
| 2 | 89 | |
| 1 1/2 | 81 | |
| 1 | 74 | |
| 3/4 | 69 | |
| 1/2 | 63 | |
| 3/8 | 57 | |
| 1/4 | 50 | |
| No.4 | 45 | |
| 8 | 37 | |
| 10 | 36 | |
| 16 | 31 | |
| 30 | 27 | |
| 40 | 25 | |
| 50 | 23 | |
| 100 | 20 | |
| 200 | 17 | |

LABORATORY COMPACTION CHARACTERISTICS : **ASTM D698** **METHOD C**



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: **39**
MAXIMUM DENSITY, LBF/FT$^3$ → **136.1**
OPTIMUM MOISTURE CONTENT, % → **8.2**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **31**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.85**

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 — PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO — PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED — % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % — DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING — 100 REV, % LOSS → | | |
| GRADING — 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. — SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

**SOIL CLASSIFICATION :**
GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-07-11
Job No. 3151JM098
Event / Invoice No. 31510186-102 Lab No. 0981130-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-6D, 3.5'-7.5' ELEVATION
Testing Authorized :
Special Instructions :

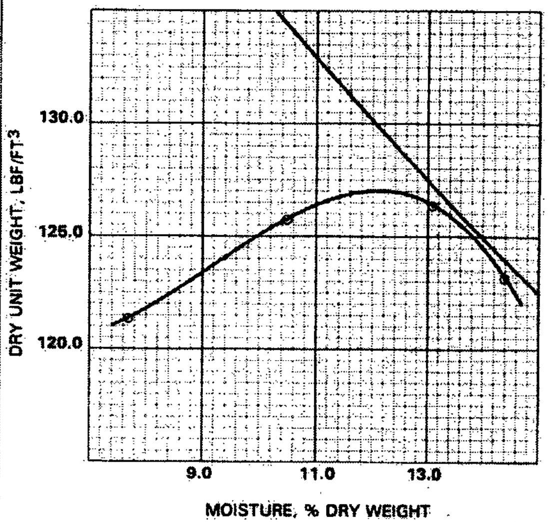
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 90 | |
| 1 1/2 | 85 | |
| 1 | 78 | |
| 3/4 | 73 | |
| 1/2 | 69 | |
| 3/8 | 64 | |
| 1/4 | 64 | |
| No.4 | 53 | |
| 8 | 44 | |
| 10 | 44 | |
| 16 | 38 | |
| 30 | 33 | |
| 40 | 31 | |
| 50 | 29 | |
| 100 | 24 | |
| 200 | 19 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 40
MAXIMUM DENSITY, LBF/FT$^3$ → 127.0
OPTIMUM MOISTURE CONTENT, % → 12.1

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 27

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.78

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-07-11
Job No. 3151JM098
Event / Invoice No. 31510186-103
Lab No. 0981130-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-6D, 17.5'-20' ELEVATION
Testing Authorized :
Special Instructions :

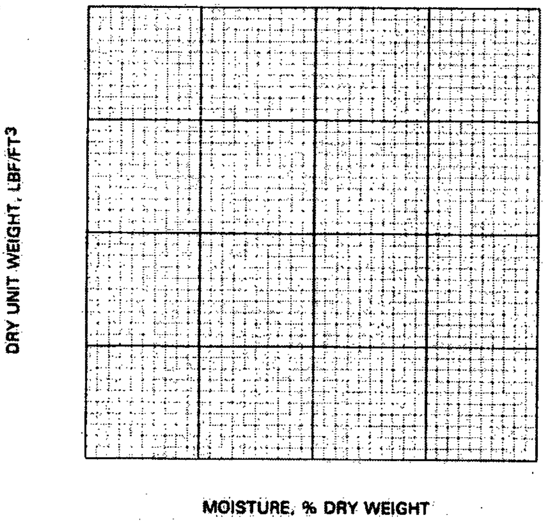
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | 100 | |
| 1 1/2 | 97 | |
| 1 | 93 | |
| 3/4 | 91 | |
| 1/2 | 89 | |
| 3/8 | 86 | |
| 1/4 | 83 | |
| No.4 | 81 | |
| 8 | 76 | |
| 10 | 75 | |
| 16 | 71 | |
| 30 | 67 | |
| 40 | 65 | |
| 50 | 63 | |
| 100 | 58 | |
| 200 | 52 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-07-11
Job No. 3151JM098
Event / Invoice No. 31510186-104 Lab No. 0981130-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location MW-6D, 31.5'- 36.5'ELEVATION
Testing Authorized :
Special Instructions :

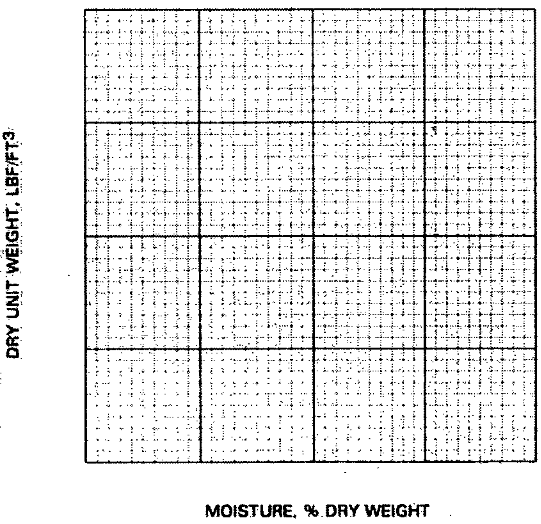
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 92 | |
| 3 | 86 | |
| 2 | 84 | |
| 1 1/2 | 80 | |
| 1 | 73 | |
| 3/4 | 68 | |
| 1/2 | 63 | |
| 3/8 | 59 | |
| 1/4 | 55 | |
| No.4 | 52 | |
| 8 | 48 | |
| 10 | 46 | |
| 16 | 42 | |
| 30 | 38 | |
| 40 | 36 | |
| 50 | 33 | |
| 100 | 27 | |
| 200 | 22 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **pH DETERMINATION :**<br>pH → | | |
| | | | **SOLUBLE SALTS :**<br>PPM → | | |
| | | | **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# LABORATORY REPORT

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-42 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location NSR-1
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 7 | 15.4 | | | |
| 13 | 14.7 | 26 | 18 | 8 |
| 17 | 14.7 | | | |
| 26 | 15.2 | | | |
| 31 | 12.5 | | | |
| 43 | 10.0 | 22 | 19 | 3 |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-43 Lab No. 0981114-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location NSR-1, 7' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | 100 | |
| 1 | 95 | |
| 3/4 | 94 | |
| 1/2 | 90 | |
| 3/8 | 87 | |
| 1/4 | 82 | |
| No.4 | 78 | |
| 8 | 68 | |
| 10 | 65 | |
| 16 | 58 | |
| 30 | 51 | |
| 40 | 47 | |
| 50 | 44 | |
| 100 | 39 | |
| 200 | 34 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS ☐ ASTM C125 → | | |
| ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 — FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| VOIDS, % → | | |
| ☐ RODDING ☐ JIGGING ☐ LOOSE — COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 — BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| AGGREGATE DRIED ☐ YES ☐ NO — APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 — BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| AGGREGATE DRIED ☐ YES ☐ NO — APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 — SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 — GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535 — GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113 — FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112 — FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA — ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 — $D_c$ → | | |
| PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE — $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD — VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-15-11
Job No. 3151JM098
Event / Invoice No. 31510186-44 Lab No. 0981114-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location NSR-1, 34' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 93 | |
| 1 1/2 | 87 | |
| 1 | 73 | |
| 3/4 | 66 | |
| 1/2 | 59 | |
| 3/8 | 55 | |
| 1/4 | 48 | |
| No.4 | 43 | |
| 8 | 35 | |
| 10 | 33 | |
| 16 | 29 | |
| 30 | 24 | |
| 40 | 22 | |
| 50 | 21 | |
| 100 | 17 | |
| 200 | 14 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M$^3$ → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M$^3$ → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# LABORATORY REPORT

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-01 Lab No. 0981021
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-2011
Submitted By D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location NSR2
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 7-10 | | 28 | NV | NP |
| 10-12.5 | 23.7 | | | |
| 30-35 | 15.8 | 23 | 16 | 7 |
| 35-40 | 17.0 | | | |
| 55-56 | 28.6 | | | |
| 60-62 | 27.4 | | | |
| 67-70 | 26.3 | | | |
| 70-72 | 13.0 | | | |
| 78-80 | 21.8 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-10 Lab No. 0981018-1
Authorized by CHRIS SANCHEZ Date 10-18-11
Sampled by CLIENT Date 10-18-11
Submitted by D. SENJEM Date 10-18-11

Client **ANDERSON ENGINEERING**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIABLE**
Sample Source / Location **NSR2, 0-5' ELEVATION**
Testing Authorized :
Special Instructions :

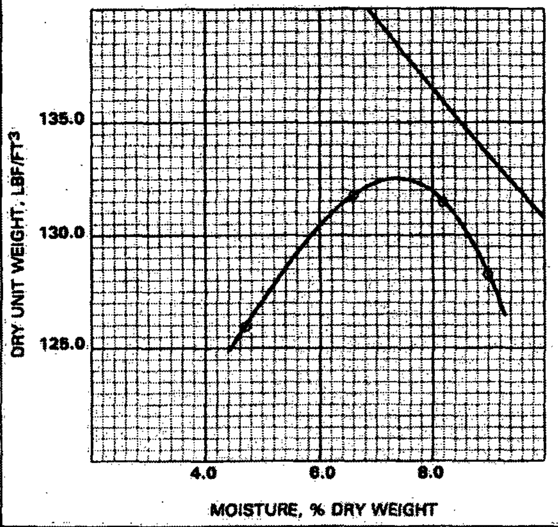
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORING**
Source / Location Desig. By **CLIENT** Date **10-18-11**

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 99 | |
| 1 1/2 | 96 | |
| 1 | 90 | |
| 3/4 | 84 | |
| 1/2 | 77 | |
| 3/8 | 72 | |
| 1/4 | 65 | |
| No.4 | 61 | |
| 8 | 52 | |
| 10 | 50 | |
| 16 | 48 | |
| 30 | 39 | |
| 40 | 36 | |
| 50 | 32 | |
| 100 | 25 | |
| 200 | 20 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 10
MAXIMUM DENSITY, LBF/FT$^3$ → 132.5
OPTIMUM MOISTURE CONTENT, % → 7.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 15

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 136.6
CORR. OPTIMUM MOISTURE, % 6.4

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH →<br>SOLUBLE SALTS :<br>PPM →<br>MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-11 Lab No. 0981018-2
Authorized by CHRIS SANCHEZ Date 10-18-11
Sampled by CLIENT Date 10-18-11
Submitted by D. SENJEM Date 10-18-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location NSR2, 15-20' ELEVATION
Testing Authorized :
Special Instructions :

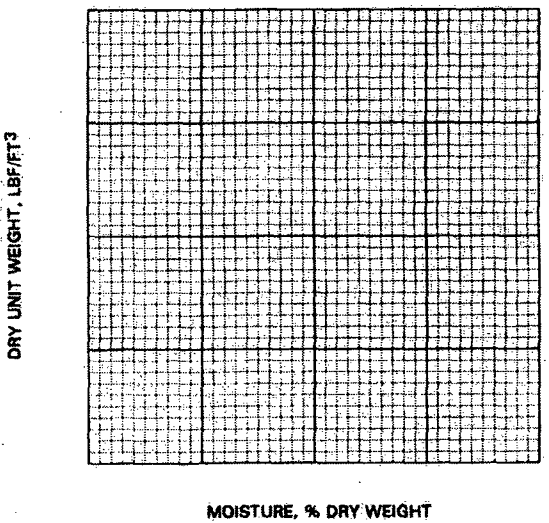
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-18-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 93 | |
| 3 | 82 | |
| 2 | 69 | |
| 1 1/2 | 64 | |
| 1 | 58 | |
| 3/4 | 53 | |
| 1/2 | 47 | |
| 3/8 | 43 | |
| 1/4 | 39 | |
| No.4 | 36 | |
| 8 | 31 | |
| 10 | 30 | |
| 16 | 26 | |
| 30 | 22 | |
| 40 | 20 | |
| 50 | 18 | |
| 100 | 14 | |
| 200 | 11 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

REVIEWED BY

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The Quality People
Since 1955

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Durango, Colorado 81302
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# LABORATORY REPORT

Date of Report 11-10-11
Job No. 3151JM098
Event / Invoice No. 31510186-20
Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-20-11
Submitted By D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location NSR3
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 5-10 | 14.8 | 32 | 20 | 12 |
| 13-15 | 12.8 | | | |
| 15-18 | 9.3 | | | |
| 23-25 | 14.4 | | | |
| 34-37 | 18.9 | | | |
| 40-45 | 17.5 | | | |
| 47--50 | 12.1 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

Copies To: CLIENT (2)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-10-11
Job No. 3151JM098
Event / Invoice No. 31510186-22 Lab No. 0981019-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location NSR3, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

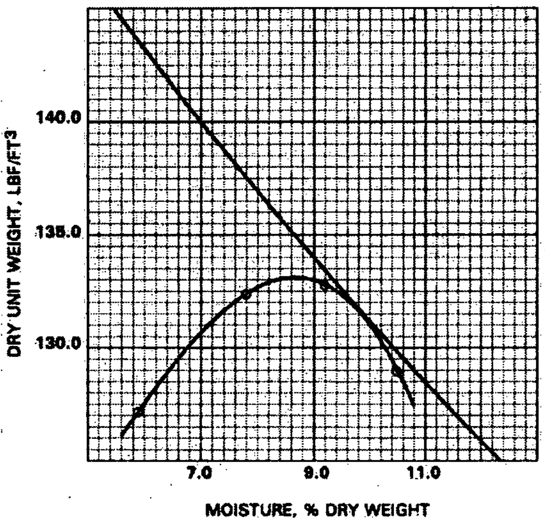
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 93 | |
| 1 1/2 | 86 | |
| 1 | 79 | |
| 3/4 | 79 | |
| 1/2 | 63 | |
| 3/8 | 58 | |
| 1/4 | 51 | |
| No.4 | 47 | |
| 8 | 39 | |
| 10 | 38 | |
| 16 | 34 | |
| 30 | 29 | |
| 40 | 27 | |
| 50 | 25 | |
| 100 | 22 | |
| 200 | 20 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 17
MAXIMUM DENSITY, LBF/FT$^3$ → 133.1
OPTIMUM MOISTURE CONTENT, % → 8.6

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.66

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV. % LOSS →<br>GRADING 500 REV. % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# LABORATORY REPORT

|  |  |  |  |
|---|---|---|---|
| Date of Report | 11-09-11 |  |  |
| Job No. | 3151JM098 |  |  |
| Event / Invoice No. | 31510186-01 | Lab No. | 0981021 |
| Authorized By | C. SANCHEZ | Date | 10-21-11 |
| Sampled By | CLIENT | Date | 10-2011 |
| Submitted By | D. SENJEM | Date | 10-21-11 |

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location NSR4
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: | LL | PL | PI |
|---|---|---|---|---|---|
| 12 | 15.5 |  |  |  |  |
| 27 | 13.5 |  |  |  |  |
| 31 | 22.1 |  | 21 | NV | NP |
| 41 | 11.1 |  |  |  |  |
| 47 | 13.8 |  |  |  |  |
| 59 | 10.0 |  |  |  |  |
| 70 | 9.3 |  |  |  |  |
| 75 | 8.3 |  |  |  |  |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-14
Lab No. 098102141
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-21-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location NSR4, 17' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 79 | |
| 1 1/2 | 73 | |
| 1 | 70 | |
| 3/4 | 66 | |
| 1/2 | 60 | |
| 3/8 | 57 | |
| 1/4 | 52 | |
| No.4 | 49 | |
| 8 | 44 | |
| 10 | 43 | |
| 16 | 39 | |
| 30 | 35 | |
| 40 | 32 | |
| 50 | 29 | |
| 100 | 24 | |
| 200 | 19 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO.40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-13 Lab No. 098102140
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-10
Submitted by D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location NSR4, 0-5' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | 100 | |
| 1 1/2 | 92 | |
| 1 | 85 | |
| 3/4 | 82 | |
| 1/2 | 76 | |
| 3/8 | 73 | |
| 1/4 | 68 | |
| No.4 | 66 | |
| 8 | 57 | |
| 10 | 56 | |
| 16 | 50 | |
| 30 | 44 | |
| 40 | 41 | |
| 50 | 38 | |
| 100 | 31 | |
| 200 | 26 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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## LABORATORY REPORT

Date of Report **11-18-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-54** Lab No. **0981118**
Authorized By **C. SANCHEZ** Date **10-21-11**
Sampled By **CLIENT** Date **10-2011**
Submitted By **D. SENJEM** Date **10-21-11**

Client **ANDERSON ENGINEERING COMPANY, INC.**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **PDF-1**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-21-11**

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 8.5 | | | |
| 4 | 15.5 | NV | NV | NP |
| 11 | 22.3 | | | |
| 16 | 216.7 | | | |
| 21 | 46.5 | | | |
| 33 | 10.9 | | | |
| 38 | 29.1 | | | |
| 43 | 15.5 | | | |
| 48 | 23.7 | | | |

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.**

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-54 Lab No. 0981118-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-1, 1' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 99 | |
| 1 1/2 | 93 | |
| 1 | 69 | |
| 3/4 | 68 | |
| 1/2 | 61 | |
| 3/8 | 54 | |
| 1/4 | 47 | |
| No.4 | 43 | |
| 8 | 37 | |
| 10 | 36 | |
| 16 | 32 | |
| 30 | 27 | |
| 40 | 24 | |
| 50 | 21 | |
| 100 | 15 | |
| 200 | 12 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C136 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE | UNIT WEIGHT, KG/M$^3$ → | | |
| | | VOIDS, % → | | |
| | COARSE AGGREGATE | UNIT WEIGHT, KG/M$^3$ → | | |
| | | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION | FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| | COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION | SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES | ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES | ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT | ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX | ☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT | ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **11-21-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-56** Lab No. **0981118-3**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Client **ANDERSON ENGINEERING**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIABLE**
Sample Source / Location **PDF-1, 4'ELEVATION**
Testing Authorized :
Special Instructions :

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORING**
Source / Location Desig. By **CLIENT** Date **10-21-11**

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | 100 | |
| 8 | 99 | |
| 10 | 99 | |
| 16 | 98 | |
| 30 | 98 | |
| 40 | 97 | |
| 60 | 96 | |
| 100 | 77 | |
| 200 | 28 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

Copies to : **CLIENT (1)**

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Since 1955

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-56 Lab No. 0981118-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-1, 16'ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | 100 | |
| 16 | 99 | |
| 30 | 95 | |
| 40 | 89 | |
| 50 | 82 | |
| 100 | 68 | |
| 200 | 43 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-58 Lab No. 0981118-5
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-1, 33' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 90 | |
| 2 | 74 | |
| 1 1/2 | 68 | |
| 1 | 61 | |
| 3/4 | 56 | |
| 1/2 | 48 | |
| 3/8 | 44 | |
| 1/4 | 39 | |
| No.4 | 35 | |
| 8 | 29 | |
| 10 | 28 | |
| 16 | 25 | |
| 30 | 20 | |
| 40 | 18 | |
| 50 | 16 | |
| 100 | 12 | |
| 200 | 9.3 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS ☐ ASTM C136 → | | |
| ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE — FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| VOIDS, % → | | |
| COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO — BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO — BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113 — FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112 — FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA — ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE : A ☐ COARSE B. ☐ FINE C ☐ COARSE & FINE — $D_c$ → | | |
| $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD VC, % → | | |

Comments :

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THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-21-11
Job No. 3161JM098
Event / Invoice No. 31510186-59 Lab No. 0981118-6
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-1, 48' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | 100 | |
| 1/4 | 99 | |
| No.4 | 99 | |
| 8 | 96 | |
| 10 | 95 | |
| 16 | 92 | |
| 30 | 84 | |
| 40 | 77 | |
| 50 | 67 | |
| 100 | 44 | |
| 200 | 24 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS ☐ ASTM C125 → | | |
| ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# LABORATORY REPORT

Date of Report 11-28-11
Job No. 3151JM098
Event / Invoice No. 31510186-66 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location PDF-2
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 2 | 17.5 | NV | NV | NP |
| 6 | 20.4 | | | |
| 11 | 29.9 | | | |
| 17 | 55.9 | | | |
| 21 | 62.6 | | | |
| 28 | 41.0 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-28-11
Job No. 3151JM098
Event / Invoice No. 31510186-67 Lab No. 0981123-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-2, 2-5' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | 100 | |
| 16 | 99 | |
| 30 | 99 | |
| 40 | 99 | |
| 50 | 98 | |
| 100 | 82 | |
| 200 | 25 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

Copies to : CLIENT (1)

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

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Durango, Colorado 81302
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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-28-11
Job No. 3151JM098
Event / Invoice No. 31510186-68 Lab No. 0981123-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-2, 10-15'ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | 100 | |
| 16 | 99 | |
| 30 | 98 | |
| 40 | 96 | |
| 50 | 93 | |
| 100 | 76 | |
| 200 | 37 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | RESULTS | SPECS |
|---|---|---|
| UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE — FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| FINE AGGREGATE VOIDS, % → | | |
| COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| COARSE AGGREGATE VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION — FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO — BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO — BULK SPECIFIC GRAVITY → | | |
| BULK SPECIFIC GRAVITY (SSD) → | | |
| APPARENT SPECIFIC GRAVITY → | | |
| ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 SE, % → | | |
| RESISTANCE TO DEGRADATION — SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING 100 REV., %LOSS → | | |
| GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING 200 REV., %LOSS → | | |
| GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113 FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112 FINE AGGREGATE, % → | | |
| COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☐ FAA ONE OR MORE FACES, % → | | |
| TWO OR MORE FACES, % → | | |
| DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE $D_c$ → | | |
| $D_f$ → | | |
| UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-28-11
Job No. 3151JM098
Event / Invoice No. 31510186-69 Lab No. 0981123-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-2, 20-25' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | 100 | |
| 1/2 | 98 | |
| 3/8 | 97 | |
| 1/4 | 96 | |
| No.4 | 96 | |
| 8 | 95 | |
| 10 | 95 | |
| 16 | 94 | |
| 30 | 90 | |
| 40 | 86 | |
| 50 | 81 | |
| 100 | 68 | |
| 200 | 45 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-28-11
Job No. 3151JM098
Event / Invoice No. 31510186-70 Lab No. 0981123-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-2, 27-30' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 5 | 100 | |
| 4 | 89 | |
| 3 | 76 | |
| 2 | 66 | |
| 1 1/2 | 59 | |
| 1 | 51 | |
| 3/4 | 47 | |
| 1/2 | 42 | |
| 3/8 | 39 | |
| 1/4 | 36 | |
| No.4 | 34 | |
| 8 | 31 | |
| 10 | 30 | |
| 16 | 28 | |
| 30 | 26 | |
| 40 | 24 | |
| 50 | 23 | |
| 100 | 20 | |
| 200 | 16 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE | UNIT WEIGHT, KG/M³ → | | |
| | | VOIDS, % → | | |
| | COARSE AGGREGATE | UNIT WEIGHT, KG/M³ → | | |
| | | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION | FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| | COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION | SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES | ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES | ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT | ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX | ☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C: ☐ COARSE & FINE | $D_c$ → | | |
| | | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT | ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# LABORATORY REPORT

Date of Report 11-18-11
Job No. 3151JM098
Event / Invoice No. 31510186-50 Lab No. 0981118
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-2011
Submitted By D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location PDF-3
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 4 | 19.0 | 27 | 27 | NP |
| 9 | 30.2 | | | |
| 19 | 39.5 | | | |
| 24 | 53.7 | 40 | 40 | NP |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-51 Lab No. 0981112-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-3, 0-3.5' ELEVATION
Testing Authorized :
Special Instructions :

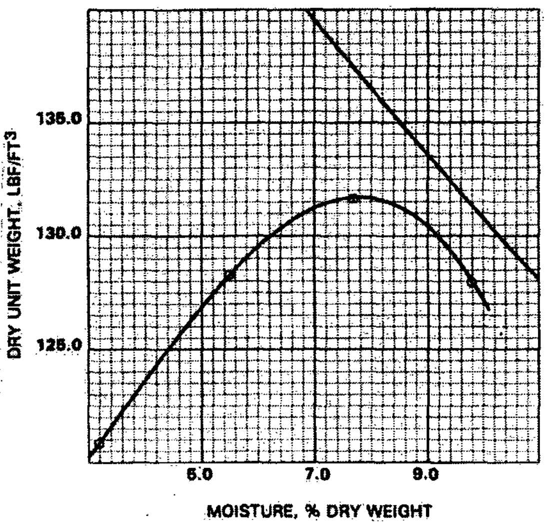
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | 100 | |
| 3/4 | 99 | |
| 1/2 | 90 | |
| 3/8 | 81 | |
| 1/4 | 71 | |
| No.4 | 66 | |
| 8 | 56 | |
| 10 | 54 | |
| 16 | 48 | |
| 30 | 40 | |
| 40 | 34 | |
| 50 | 29 | |
| 100 | 20 | |
| 200 | 15 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 20
MAXIMUM DENSITY, LBF/FT$^3$ → 131.7
OPTIMUM MOISTURE CONTENT, % → 7.8

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **pH DETERMINATION :**<br>pH → | | |
| | | | **SOLUBLE SALTS :**<br>PPM → | | |
| | | | **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-21-11
Job No. 3161JM098
Event / Invoice No. 31510186-52 Lab No. 0981118-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-3, 10-12.5' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | | |
| 16 | 100 | |
| 30 | 99 | |
| 40 | 99 | |
| 50 | 99 | |
| 100 | 98 | |
| 200 | 92 | |

**LIQUID LIMIT & PLASTIC PROPERTIES**
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| **FINENESS MODULUS**<br>☐ ASTM C125 → | | |
| **ORGANIC IMPURITIES**<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| **CLEANNESS VALUE**<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| **UNIT WEIGHT & VOIDS**<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE | UNIT WEIGHT, KG/M³ → | | |
| | | VOIDS, % → | | |
| | COARSE AGGREGATE | UNIT WEIGHT, KG/M³ → | | |
| | | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION | FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| | COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| **SAND EQUIVALENT VALUE** | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION | SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | | GRADING 1000 REV., %LOSS → | | |
| **LIGHTWEIGHT PIECES**<br>☐ ASTM C123 ☐ AASHTO T113 | | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| **CLAY LUMPS & FRIABLE PARTICLES**<br>☐ ASTM C142 ☐ AASHTO T112 | | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| **FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT**<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| **DURABILITY INDEX**<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | | $D_c$ → | | |
| | | $D_f$ → | | |
| **UNCOMPACTED VOID CONTENT**<br>☐ AZ 247 ☐ ASTM C1252 METHOD | | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-21-11
Job No. 3151JM098
Event / Invoice No. 31510186-53 Lab No. 0981118-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location PDF-3, 23-28' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

**SIEVE ANALYSIS** ☒ ASTM C136 ☐ AASHTO T27
**FINER THAN #200** ☒ ASTM C117 ☐ AASHTO T11

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | 100 | |
| 8 | 99 | |
| 10 | 98 | |
| 16 | 97 | |
| 30 | 96 | |
| 40 | 95 | |
| 50 | 93 | |
| 100 | 90 | |
| 200 | 84 | |

**LIQUID LIMIT & PLASTIC PROPERTIES**
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| **FINENESS MODULUS** ☐ ASTM C125 → | | |
| **ORGANIC IMPURITIES** ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| **CLEANNESS VALUE** ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| **UNIT WEIGHT & VOIDS** ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M³ → | | |
| | VOIDS, % → | | |
| **SPECIFIC GRAVITY & ABSORPTION** FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| **SAND EQUIVALENT VALUE** ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| **RESISTANCE TO DEGRADATION** SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| **LIGHTWEIGHT PIECES** ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| **CLAY LUMPS & FRIABLE PARTICLES** ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| **FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT** ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| **DURABILITY INDEX** ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| **UNCOMPACTED VOID CONTENT** ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-03 Lab No. 098102143
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR1 10'
Testing Authorized :
Special Instructions :

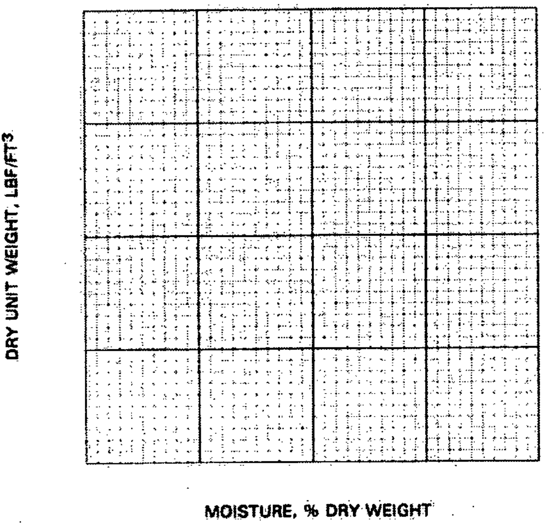
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 86 | |
| 1 1/2 | 71 | |
| 1 | 62 | |
| 3/4 | 59 | |
| 1/2 | 52 | |
| 3/8 | 48 | |
| 1/4 | 43 | |
| No.4 | 40 | |
| 8 | 35 | |
| 10 | 33 | |
| 16 | 30 | |
| 30 | 26 | |
| 40 | 24 | |
| 50 | 21 | |
| 100 | 17 | |
| 200 | 13 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT³ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90**<br>METHOD B — LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 76 — PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☒ YES ☐ NO — PLASTICITY INDEX → | NP | |
| **MOISTURE CONTENT :**<br>PORTION TESTED — % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % — DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. — SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-02 Lab No. 098102133
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location SSR1/1' ELEVATION
Testing Authorized :
Special Instructions :

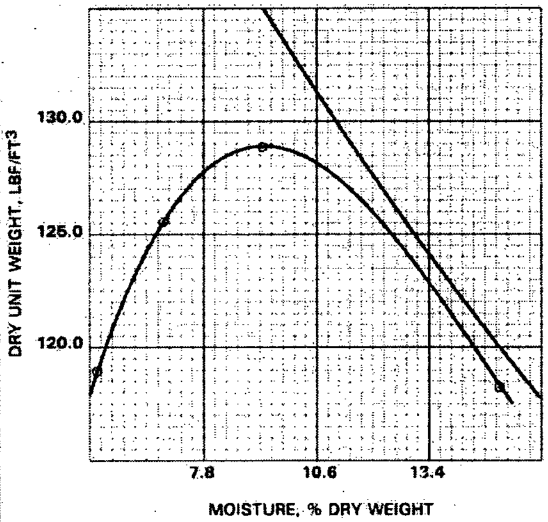
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

**SIEVE ANALYSIS :**
**FINER THAN NO. 200 :**

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| | | |

**LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C**



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 13
MAXIMUM DENSITY, LBF/FT$^3$ → 128.9
OPTIMUM MOISTURE CONTENT, % → 9.2

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 0.0
% OVERSIZE IN LAB SAMPLE : 26

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.70

**CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718**

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 136.8
CORR. OPTIMUM MOISTURE, % 6.8

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90** | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| METHOD B LIQUID LIMIT → | 29 | | GRADING 100 REV, % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 0 PLASTIC LIMIT → | 17 | | GRADING 500 REV, % LOSS → | | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 12 | | | | |
| **MOISTURE CONTENT :** | | | **SPECIFIC GRAVITY :** | | |
| PORTION TESTED % DRY WEIGHT → | | | MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | | **pH DETERMINATION :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | | pH → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | | **SOLUBLE SALTS :** | | |
| | | | PPM → | | |
| SURCHARGE, KSF | | | **MINIMUM RESISTIVITY :** | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | OHM-CM → | | |

**SOIL CLASSIFICATION :**
GROUP SYMBOL:
NAME:

Comments :

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# LABORATORY REPORT

Date of Report **11-09-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-01** Lab No. **0981021**
Authorized By **C. SANCHEZ** Date **10-21-11**
Sampled By **CLIENT** Date **10-2011**
Submitted By **D. SENJEM** Date **10-21-11**

Client **ANDERSON ENGINEERING COMPANY, INC.**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Location **RICO, COLORADO**
Contractor **FLARE CONSTRUCTION**
Arch. / Engr. **ANDERSON ENGINEERING**
Type / Use of Material **VARIOUS**
Supplier / Source **BORINGS**
Sample Source / Location **SSR1**
Source / Location Desig. By **CLIENT** Date **10-21-11**
Reference: **ASTM**
Special Instructions:

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 1 | 9.6 | 29 | 17 | 12 |
| 7 | 9.5 | | | |
| 10 | 4.0 | 24 | NV | NP |
| 17 | 8.2 | | | |
| 24 | 12.1 | | | |
| 30 | 10.0 | | | |
| 35 | 11.0 | | | |
| 48 | 5.8 | | | |
| 57 | 9.7 | | | |
| 63 | 11.3 | | | |
| 76 | 16.0 | | | |
| 90 | 10.7 | | | |

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.**

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# LABORATORY REPORT

Date of Report **11-09-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-01** Lab No. **0981021**
Authorized By **C. SANCHEZ** Date **10-21-11**
Sampled By **CLIENT** Date **10-2011**
Submitted By **D. SENJEM** Date **10-21-11**

Client **ANDERSON ENGINEERING COMPANY, INC.**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **SSR2**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-21-11**

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 2 | 9.8 | 28 | 19 | 9 |
| 7 | 6.9 | 28 | 18 | 10 |
| 12 | 7.9 | | | |
| 17 | 12.4 | | | |
| 24 | 16.0 | | | |
| 31 | 20.5 | 28 | 17 | 11 |
| 36 | 28.8 | | | |
| 66 | 10.4 | | | |
| 75 | 37.7 | | | |

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.**

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-08 Lab No. 0981021-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-21-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR2, 6-12' ELEVATION
Testing Authorized :
Special Instructions :

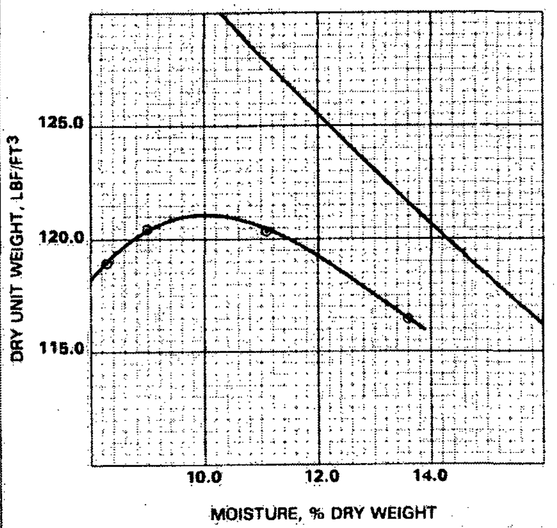
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS :
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| | | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 15
MAXIMUM DENSITY, LBF/FT$^3$ → 121.1
OPTIMUM MOISTURE CONTENT, % → 9.9

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-05 Lab No. 098102139
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-10
Submitted by D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR2, 66' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

**SIEVE ANALYSIS** ☐ ASTM C136 ☒ CP-31
**FINER THAN #200** ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | | |
| 3 | | |
| 2 | 100 | |
| 1 1/2 | 94 | |
| 1 | 86 | |
| 3/4 | 73 | |
| 1/2 | 62 | |
| 3/8 | 55 | |
| 1/4 | 48 | |
| No.4 | 44 | |
| 8 | 37 | |
| 10 | 36 | |
| 16 | 32 | |
| 30 | 29 | |
| 40 | 26 | |
| 50 | 24 | |
| 100 | 19 | |
| 200 | 14 | |

**LIQUID LIMIT & PLASTIC PROPERTIES**
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| **FINENESS MODULUS**<br>☐ ASTM C125 → | | |
| **ORGANIC IMPURITIES**<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| **CLEANNESS VALUE**<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| **UNIT WEIGHT & VOIDS**<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE | UNIT WEIGHT, KG/M³ → | | |
| | | VOIDS, % → | | |
| | COARSE AGGREGATE | UNIT WEIGHT, KG/M³ → | | |
| | | VOIDS, % → | | |
| **SPECIFIC GRAVITY & ABSORPTION** | FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| | COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| **SAND EQUIVALENT VALUE** | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| **RESISTANCE TO DEGRADATION** | SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | | GRADING 1000 REV., %LOSS → | | |
| **LIGHTWEIGHT PIECES**<br>☐ ASTM C123 ☐ AASHTO T113 | | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| **CLAY LUMPS & FRIABLE PARTICLES**<br>☐ ASTM C142 ☐ AASHTO T112 | | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| **FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT**<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| **DURABILITY INDEX**<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | | $D_c$ → | | |
| | | $D_f$ → | | |
| **UNCOMPACTED VOID CONTENT**<br>☐ AZ 247 ☐ ASTM C1252 METHOD | | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-06 Lab No. 098102138
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-21-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING P
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR2, 75' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | 100 | |
| 1 | 90 | |
| 3/4 | 71 | |
| 1/2 | 62 | |
| 3/8 | 56 | |
| 1/4 | 49 | |
| No:4 | 45 | |
| 8 | 36 | |
| 10 | 35 | |
| 16 | 30 | |
| 30 | 25 | |
| 40 | 22 | |
| 50 | 20 | |
| 100 | 15 | |
| 200 | 11 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, KG/M3 → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☐ AASHTO T85<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-10-11
Job No. 3151JM098
Event / Invoice No. 31510186-07
Lab No. 0981021-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-21-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING PROJECT
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR2, 0-6' ELEVATION
Testing Authorized :
Special Instructions :

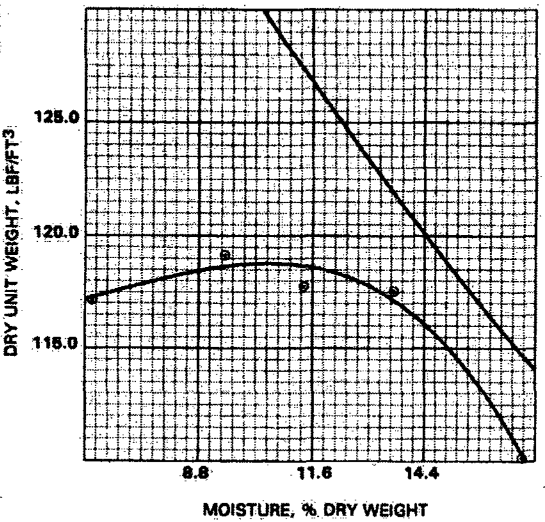
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS :
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| | | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 14
MAXIMUM DENSITY, LBF/FT$^3$ → 118.8
OPTIMUM MOISTURE CONTENT, % → 10.4

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# LABORATORY REPORT

|  |  |  |  |
|---|---|---|---|
| Date of Report | 11-18-11 |  |  |
| Job No. | 3151JM098 |  |  |
| Event / Invoice No. | 31510186-49 | Lab No. | 0981112 |
| Authorized By | C. SANCHEZ | Date | 10-21-11 |
| Sampled By | CLIENT | Date | 10-2011 |
| Submitted By | D. SENJEM | Date | 10-21-11 |

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIOUS
Sample Source / Location SSR-3
Reference: ASTM
Special Instructions:

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORINGS
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 13 | 15.4 |  |  |  |
| 30 | 15.0 |  |  |  |
| 37 | 20.2 |  |  |  |
| 39 | 11.1 |  |  |  |
| 53 | 11.6 |  |  |  |
| 70 | 8.1 |  |  |  |
| 76 | 7.5 |  |  |  |
| 87A | 7.9 |  |  |  |
| 87B | 8.5 |  |  |  |
| 91 | 19.3 |  |  |  |
| 96 | 18.5 |  |  |  |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-28-11
Job No. 3151JM098
Event / Invoice No. 31510186-62 Lab No. 0981121-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-4, 0-4'ELEVATION
Testing Authorized :
Special Instructions :

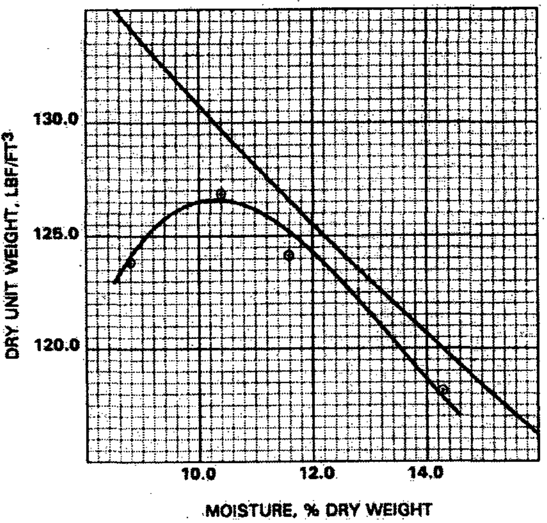
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 98 | |
| 1 1/2 | 95 | |
| 1 | 89 | |
| 3/4 | 83 | |
| 1/2 | 77 | |
| 3/8 | 73 | |
| 1/4 | 68 | |
| No.4 | 64 | |
| 8 | 57 | |
| 10 | 55 | |
| 16 | 50 | |
| 30 | 44 | |
| 40 | 41 | |
| 50 | 38 | |
| 100 | 32 | |
| 200 | 26 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 29
MAXIMUM DENSITY, LBF/FT$^3$ → 126.6
OPTIMUM MOISTURE CONTENT, % → 10.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90<br>METHOD B LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 59 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 24<br>20<br>4 | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT : AASHTO T265<br>PORTION TESTED 3/4" MINUS % DRY WEIGHT → | 7.5 | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# LABORATORY REPORT

Date of Report 11-30-11
Job No. 3151JM098
Event / Invoice No. 31510186-79 Lab No.
Authorized By C. SANCHEZ Date 10-21-11
Sampled By CLIENT Date 10-21-11
Submitted By D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING COMPANY, INC.
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL & DRYING
Location RICO, COLORADO
Contractor FLARE CONSTRUCTION
Arch. / Engr. ANDERSON ENGINEERING
Type / Use of Material VARIOUS
Supplier / Source BORINGS
Sample Source / Location SSR-5
Source / Location Desig. By CLIENT Date 10-21-11
Reference: ASTM
Special Instructions:

## TEST RESULTS

| ELEVATION (FT) | MOISTURE CONTENT (%) | ATTERBERGS: LL | PL | PI |
|---|---|---|---|---|
| 0-4 | 6.5 | | | |
| 6 | 12.4 | 25 | 23 | 2 |
| 9 | 29.3 | | | |
| 13 | 25.6 | | | |
| 17 | 42.9 | | | |
| 22 | 76.7 | | | |
| 27 | 13.2 | 21 | 20 | 1 |
| 32 | 10.3 | | | |
| 40 | 23.8 | | | |
| 48 | 26.9 | | | |
| 57 | 27.9 | | | |

Comments: SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATION, ATTERBERG LIMITS, AND MOISTURE DENSITY RELATIONSHIPS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-30-11
Job No. 3151JM098
Event / Invoice No. 31510186-80 Lab No. 0981121-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 0-4' ELEVATION
Testing Authorized :
Special Instructions :

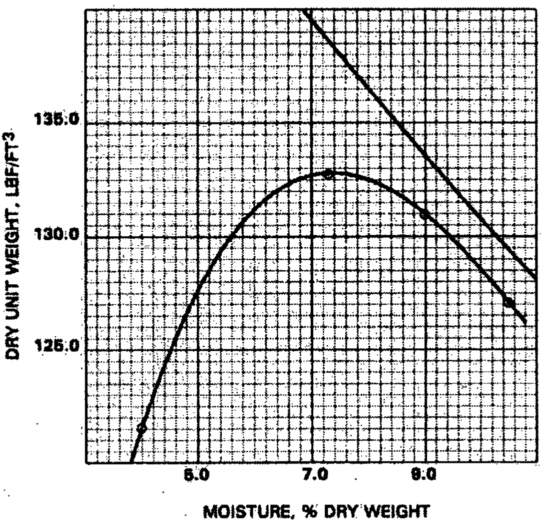
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 99 | |
| 1 1/2 | 92 | |
| 1 | 78 | |
| 3/4 | 69 | |
| 1/2 | 59 | |
| 3/8 | 53 | |
| 1/4 | 46 | |
| No.4 | 43 | |
| 8 | 36 | |
| 10 | 31 | |
| 16 | 31 | |
| 30 | 26 | |
| 40 | 23 | |
| 50 | 19 | |
| 100 | 13 | |
| 200 | 10 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 28
MAXIMUM DENSITY, LBF/FT$^3$ → 132.8
OPTIMUM MOISTURE CONTENT, % → 7.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| LIQUID LIMIT → | | | GRADING 100 REV, % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | | GRADING 500 REV, % LOSS → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | | | |
| **MOISTURE CONTENT :** | | | **SPECIFIC GRAVITY :** | | |
| PORTION TESTED % DRY WEIGHT → | | | MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | | **pH DETERMINATION :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | | pH → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | | **SOLUBLE SALTS :** | | |
| SURCHARGE, KSF | | | PPM → | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **MINIMUM RESISTIVITY :** | | |
| | | | OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-30-11
Job No. 3151JM098
Event / Invoice No. 31510186-81 Lab No. 0981121-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 6' ELEVATION
Testing Authorized :
Special Instructions :

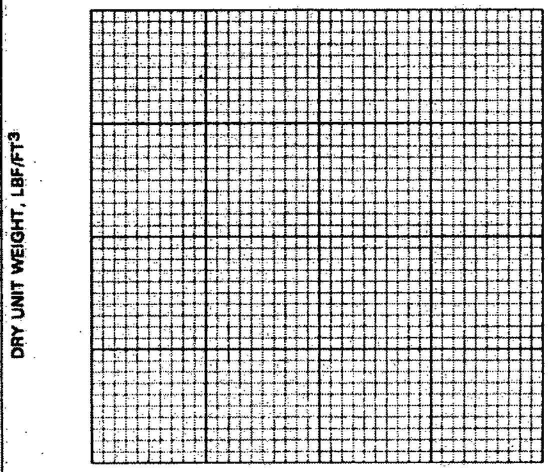
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 :

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 97 | |
| 1 1/2 | 94 | |
| 1 | 92 | |
| 3/4 | 90 | |
| 1/2 | 88 | |
| 3/8 | 85 | |
| 1/4 | 82 | |
| No.4 | 79 | |
| 8 | 74 | |
| 10 | 73 | |
| 16 | 68 | |
| 30 | 59 | |
| 40 | 54 | |
| 50 | 48 | |
| 100 | 38 | |
| 200 | 31 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90** | | |
| METHOD B LIQUID LIMIT → | 25 | |
| ESTIMATED % RETAINED ON NO. 40 46 PLASTIC LIMIT → | 23 | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 2 | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-01-11
Job No. 3151JM098
Event / Invoice No. 31510186-82 Lab No. 0981121-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 9' ELEVATION
Testing Authorized :
Special Instructions :

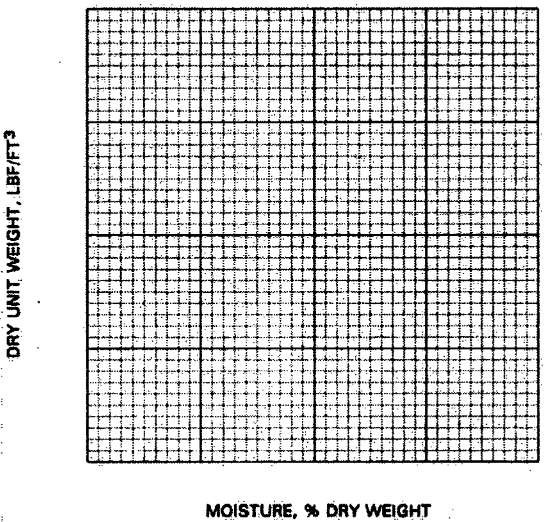
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | 100 | |
| 1 1/2 | 91 | |
| 1 | 88 | |
| 3/4 | 88 | |
| 1/2 | 88 | |
| 3/8 | 88 | |
| 1/4 | 88 | |
| No.4 | 88 | |
| 8 | 87 | |
| 10 | 87 | |
| 16 | 87 | |
| 30 | 86 | |
| 40 | 86 | |
| 50 | 86 | |
| 100 | 83 | |
| 200 | 65 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-01-11
Job No. 3151JM098
Event / Invoice No. 31510186-83
Lab No. 0981121-4

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 17'ELEVATION
Testing Authorized :
Special Instructions :

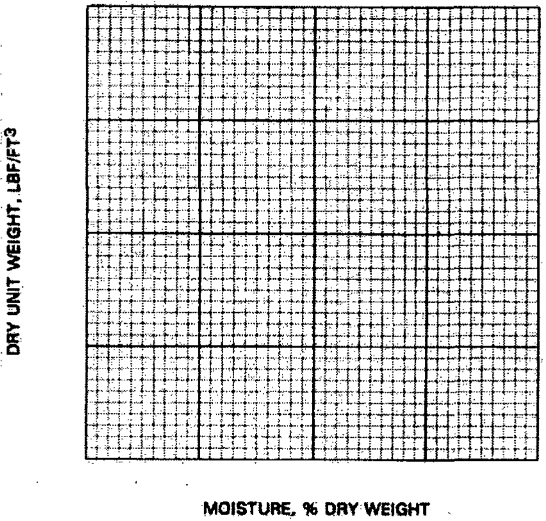
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | 100 | |
| 1/2 | 99 | |
| 3/8 | 99 | |
| 1/4 | 99 | |
| No.4 | 99 | |
| 8 | 98 | |
| 10 | 97 | |
| 16 | 97 | |
| 30 | 96 | |
| 40 | 96 | |
| 50 | 95 | |
| 100 | 89 | |
| 200 | 69 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-01-11
Job No. 3151JM098
Event / Invoice No. 31510186-84 Lab No. 0981122-5
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 22' ELEVATION
Testing Authorized :
Special Instructions :

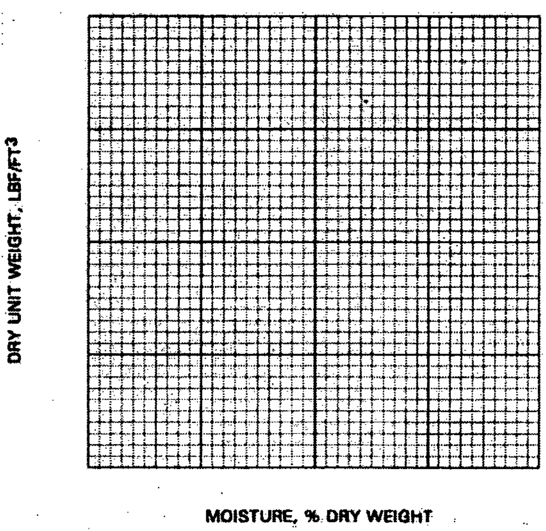
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | 100 | |
| 1/4 | 99 | |
| No.4 | 98 | |
| 8 | 95 | |
| 10 | 95 | |
| 16 | 93 | |
| 30 | 91 | |
| 40 | 89 | |
| 50 | 88 | |
| 100 | 79 | |
| 200 | 56 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| LIQUID & PLASTIC PROPERTIES : | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| MOISTURE CONTENT : | | |
| PORTION TESTED % DRY WEIGHT → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| SPECIFIC GRAVITY : | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| pH DETERMINATION : | | |
| pH → | | |
| SOLUBLE SALTS : | | |
| PPM → | | |
| MINIMUM RESISTIVITY : | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-01-11
Job No. 3151JM098
Event / Invoice No. 31510186-85
Lab No. 0981122-6
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 40-45' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | 100 | |
| 1/4 | 98 | |
| No.4 | 96 | |
| 8 | 91 | |
| 10 | 89 | |
| 16 | 83 | |
| 30 | 72 | |
| 40 | 62 | |
| 50 | 45 | |
| 100 | 23 | |
| 200 | 11 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD

DRY UNIT WEIGHT, LBF/FT3

MOISTURE, % DRY WEIGHT

SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT3 →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | **pH DETERMINATION :**<br>pH →<br>**SOLUBLE SALTS :**<br>PPM →<br>**MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-01-11
Job No. 3151JM098
Event / Invoice No. 31510186-86 Lab No. 0981122-7
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 47-50' ELEVATION
Testing Authorized :
Special Instructions :

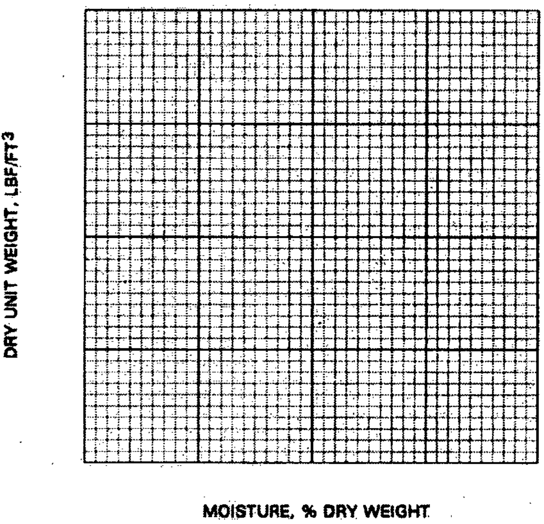
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | | |
| 16 | | |
| 30 | | |
| 40 | 100 | |
| 50 | 99 | |
| 100 | 84 | |
| 200 | 39 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-01-11
Job No. 3151JM098
Event / Invoice No. 31510186-87 Lab No. 0981122-8
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location SSR-5, 55-60' ELEVATION
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 1/2 | | |
| 1 | | |
| 3/4 | | |
| 1/2 | | |
| 3/8 | | |
| 1/4 | | |
| No.4 | | |
| 8 | | |
| 10 | | |
| 16 | | |
| 30 | | |
| 40 | 100 | |
| 50 | 99 | |
| 100 | 82 | |
| 200 | 49 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD

DRY UNIT WEIGHT, LBF/FT³

MOISTURE, % DRY WEIGHT

SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT³ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-76 Lab No. 0981123-5
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-E8 (TP2001-FD1)
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

**SIEVE ANALYSIS** ☐ ASTM C136 ☒ CP-31
**FINER THAN #200** ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 89 | |
| 2 | 65 | |
| 1 1/2 | 50 | |
| 1 | 31 | |
| 3/4 | 25 | |
| 1/2 | 21 | |
| 3/8 | 19 | |
| 1/4 | 17 | |
| No.4 | 16 | |
| 8 | 13 | |
| 10 | 13 | |
| 16 | 11 | |
| 30 | 10 | |
| 40 | 9 | |
| 50 | 8 | |
| 100 | 7 | |
| 200 | 5.3 | |

**LIQUID LIMIT & PLASTIC PROPERTIES**
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| **FINENESS MODULUS** ☐ ASTM C125 → | | |
| **ORGANIC IMPURITIES** ☐ ASTM C40 ☐ AASHTO T21 PLATE NO. → | | |
| **CLEANNESS VALUE** ☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| **UNIT WEIGHT & VOIDS** ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, PCF → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, PCF → | | |
| | VOIDS, % → | | |
| **SPECIFIC GRAVITY & ABSORPTION** — FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE ☐ ASTM C127 ☒ AASHTO T85 AGGREGATE DRIED ☒ YES ☐ NO | BULK SPECIFIC GRAVITY → | 2.721 | |
| | BULK SPECIFIC GRAVITY (SSD) → | 2.767 | |
| | APPARENT SPECIFIC GRAVITY → | 2.851 | |
| | ABSORPTION, % → | 1.7 | |
| **SAND EQUIVALENT VALUE** ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| **RESISTANCE TO DEGRADATION** — SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE ☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| **LIGHTWEIGHT PIECES** ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| **CLAY LUMPS & FRIABLE PARTICLES** ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| **FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT** ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| **DURABILITY INDEX** ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| **UNCOMPACTED VOID CONTENT** ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

Copies to : CLIENT (1)

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REVIEWED BY

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The Quality People
Since 1955

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Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-02-11
Job No. 3151JM098
Event / Invoice No. 31510186-93 Lab No. 0981128-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-3A (TP2011-FD2)
Testing Authorized :
Special Instructions :

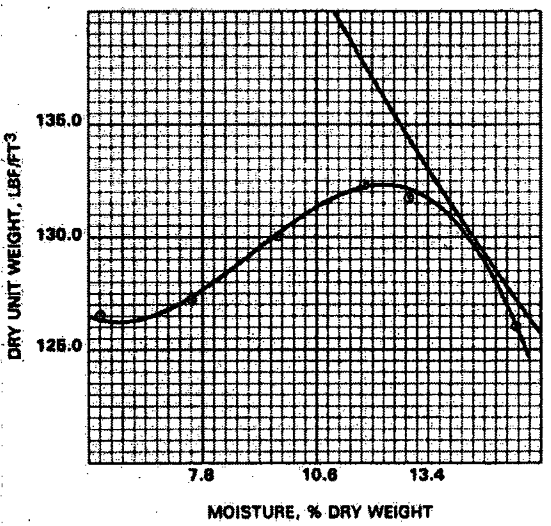
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 91 | |
| 3 | 88 | |
| 2 | 83 | |
| 1 1/2 | 78 | |
| 1 | 74 | |
| 3/4 | 69 | |
| 1/2 | 64 | |
| 3/8 | 59 | |
| 1/4 | 56 | |
| No.4 | 51 | |
| 8 | 50 | |
| 10 | 46 | |
| 16 | 43 | |
| 30 | 41 | |
| 40 | 39 | |
| 50 | 34 | |
| 100 | 26 | |
| 200 | 24 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 35
MAXIMUM DENSITY, LBF/FT$^3$ → 132.3
OPTIMUM MOISTURE CONTENT, % → 12.1

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 26

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.97

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : | | |
| METHOD B LIQUID LIMIT → | 27 | | GRADING 100 REV, % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 59 PLASTIC LIMIT → | NV | | GRADING 500 REV, % LOSS → | | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | NP | | | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : | | | pH DETERMINATION :<br>pH → | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | | SOLUBLE SALTS :<br>PPM → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | | | | |
| SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: GM
NAME: SILTY GRAVEL WITH SAND

Comments :

Copies to : CLIENT (1)

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-02-11
Job No. 3151JM098
Event / Invoice No. 31610186-94 Lab No. 0981126-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-3C1 (TP2011-FD3)
Testing Authorized :
Special Instructions :

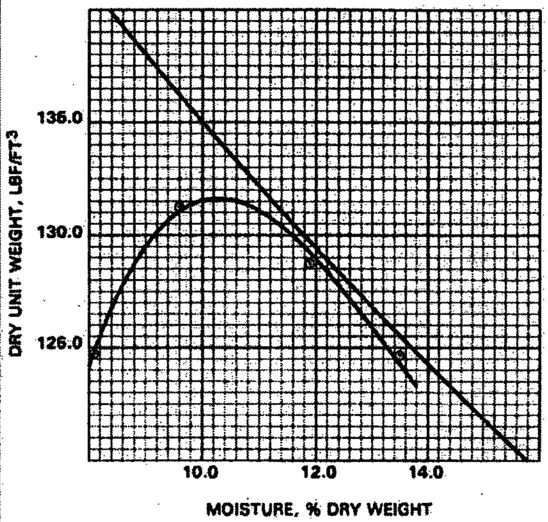
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 88 | |
| 2 | 82 | |
| 1 1/2 | 77 | |
| 1 | 66 | |
| 3/4 | 60 | |
| 1/2 | 50 | |
| 3/8 | 45 | |
| 1/4 | 41 | |
| No.4 | 38 | |
| 8 | 32 | |
| 10 | 32 | |
| 16 | 28 | |
| 30 | 26 | |
| 40 | 24 | |
| 50 | 22 | |
| 100 | 19 | |
| 200 | 16 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 36
MAXIMUM DENSITY, LBF/FT$^3$ → 131.6
OPTIMUM MOISTURE CONTENT, % → 10.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 40

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.78

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90** | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| METHOD B LIQUID LIMIT → | 27 | | | | |
| ESTIMATED % RETAINED ON NO. 40 76 PLASTIC LIMIT → | 19 | | GRADING 100 REV. % LOSS → | | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 8 | | GRADING 500 REV. % LOSS → | | |
| **MOISTURE CONTENT :** | | | **SPECIFIC GRAVITY :** | | |
| PORTION TESTED % DRY WEIGHT → | | | MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | | **pH DETERMINATION :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | | pH → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | | **SOLUBLE SALTS :** | | |
| | | | PPM → | | |
| SURCHARGE, KSF | | | **MINIMUM RESISTIVITY :** | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | OHM-CM → | | |

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: GC
NAME: CLAYEY GRAVEL WITH SAND

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-78 — Lab No. 0981123-4
Authorized by CHRIS SANCHEZ — Date 10-21-11
Sampled by CLIENT — Date 10-21-11
Submitted by D. SENJEM — Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-E1 (TP2011-FD4)
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT — Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 4 | 100 | |
| 3 | 78 | |
| 2 | 61 | |
| 1 1/2 | 58 | |
| 1 | 56 | |
| 3/4 | 54 | |
| 1/2 | 51 | |
| 3/8 | 50 | |
| 1/4 | 48 | |
| No.4 | 48 | |
| 8 | 46 | |
| 10 | 45 | |
| 16 | 44 | |
| 30 | 42 | |
| 40 | 41 | |
| 50 | 40 | |
| 100 | 36 | |
| 200 | 23 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE | UNIT WEIGHT, PCF → | | |
| | | VOIDS, % → | | |
| | COARSE AGGREGATE | UNIT WEIGHT, PCF → | | |
| | | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION | FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | | BULK SPECIFIC GRAVITY (SSD) → | | |
| | | APPARENT SPECIFIC GRAVITY → | | |
| | | ABSORPTION, % → | | |
| | COARSE AGGREGATE<br>☐ ASTM C127 ☒ AASHTO T85<br>AGGREGATE DRIED<br>☒ YES ☐ NO | BULK SPECIFIC GRAVITY → | 2.728 | |
| | | BULK SPECIFIC GRAVITY (SSD) → | 2.750 | |
| | | APPARENT SPECIFIC GRAVITY → | 2.792 | |
| | | ABSORPTION, % → | .9 | |
| SAND EQUIVALENT VALUE | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION | SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES | ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES | ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT | ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX | ☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT | ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-71 Lab No. 0981122-5
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-3D (TP2011-FD5)
Testing Authorized :
Special Instructions :

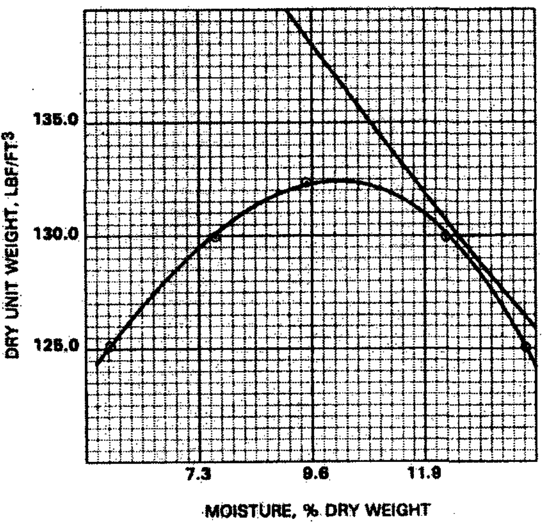
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

**SIEVE ANALYSIS : ASTM C136**
**FINER THAN NO. 200 : ASTM C117**

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 95 | |
| 3 | 95 | |
| 2 | 89 | |
| 1 1/2 | 88 | |
| 1 | 85 | |
| 3/4 | 84 | |
| 1/2 | 80 | |
| 3/8 | 77 | |
| 1/4 | 74 | |
| No.4 | 71 | |
| 8 | 67 | |
| 10 | 67 | |
| 16 | 65 | |
| 30 | 63 | |
| 40 | 62 | |
| 50 | 60 | |
| 100 | 58 | |
| 200 | 55 | |

**LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C**



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 34
MAXIMUM DENSITY, LBF/FT$^3$ → 132.4
OPTIMUM MOISTURE CONTENT, % → 9.9

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 0

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.81

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :** | | |
| LIQUID LIMIT → | | |
| ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → | | |
| SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :** | | |
| PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :** | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :** | | |
| pH → | | |
| **SOLUBLE SALTS :** | | |
| PPM → | | |
| **MINIMUM RESISTIVITY :** | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-72 Lab No. 0981123-8
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-E6 (TP2011-FD6)
Testing Authorized :
Special Instructions :

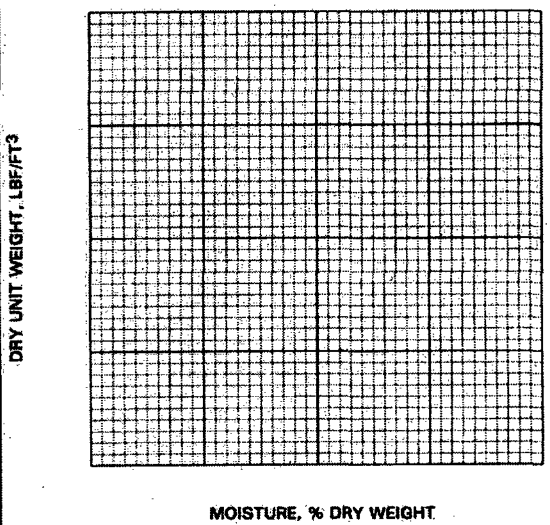
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 92 | |
| 1 1/2 | 86 | |
| 1 | 78 | |
| 3/4 | 71 | |
| 1/2 | 62 | |
| 3/8 | 55 | |
| 1/4 | 48 | |
| No.4 | 45 | |
| 8 | 39 | |
| 10 | 39 | |
| 16 | 35 | |
| 30 | 32 | |
| 40 | 30 | |
| 50 | 28 | |
| 100 | 24 | |
| 200 | 20 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **LIQUID & PLASTIC PROPERTIES :**<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | |
| **MOISTURE CONTENT :**<br>PORTION TESTED % DRY WEIGHT → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :**<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :**<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| **SPECIFIC GRAVITY :**<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **pH DETERMINATION :**<br>pH → | | |
| **SOLUBLE SALTS :**<br>PPM → | | |
| **MINIMUM RESISTIVITY :**<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-74 Lab No. 0981123-7
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-4A (TP2011-FD7)
Testing Authorized :
Special Instructions :

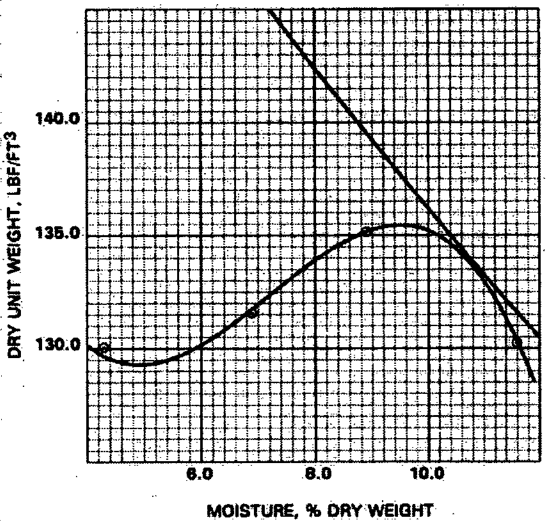
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | 100 | |
| 5 | 79 | |
| 4 | 69 | |
| 3 | 56 | |
| 2 | 50 | |
| 1 1/2 | 46 | |
| 1 | 41 | |
| 3/4 | 36 | |
| 1/2 | 31 | |
| 3/8 | 28 | |
| 1/4 | 25 | |
| No.4 | 23 | |
| 8 | 18 | |
| 10 | 18 | |
| 16 | 15 | |
| 30 | 13 | |
| 40 | 12 | |
| 50 | 11 | |
| 100 | 9 | |
| 200 | 7.5 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 32
MAXIMUM DENSITY, LBF/FT$^3$ → 135.5
OPTIMUM MOISTURE CONTENT, % → 9.5

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 64

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.79

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 153.2
CORR. OPTIMUM MOISTURE, % 4.1

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : | | |
| METHOD B LIQUID LIMIT → | 22 | | GRADING 100 REV, % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 88 PLASTIC LIMIT → | 0 | | GRADING 500 REV, % LOSS → | | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | NP | | | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF → | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-73 Lab No. 0981123-9
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-E2 (TP2011-FD8)
Testing Authorized :
Special Instructions :

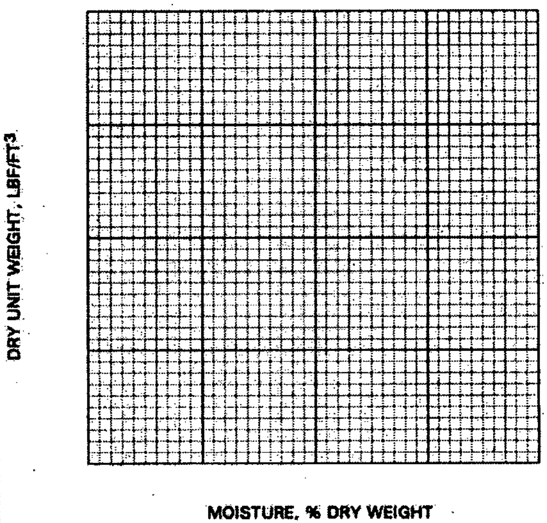
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | 100 | |
| 4 | 88 | |
| 3 | 65 | |
| 2 | 37 | |
| 1 1/2 | 24 | |
| 1 | 12 | |
| 3/4 | 8 | |
| 1/2 | 4 | |
| 3/8 | 3 | |
| 1/4 | 2 | |
| No.4 | 2 | |
| 8 | 2 | |
| 10 | 1 | |
| 16 | 1 | |
| 30 | 1 | |
| 40 | 1 | |
| 50 | 1 | |
| 100 | 1 | |
| 200 | 0.6 | |

LABORATORY COMPACTION CHARACTERISTICS : METHOD



SAMPLE PREPARATION: ☐ WET ☐ DRY
RAMMER USED:
☐ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☐ MANUAL

MAXIMUM DENSITY, LBF/FT$^3$ →
OPTIMUM MOISTURE CONTENT, % →

OVERSIZE AGGREGATE :
BULK SPECIFIC GRAVITY :
ABSORPTION, % :
% OVERSIZE IN LAB SAMPLE :

SPECIFIC GRAVITY IN ZERO AIR VOID CURVE :

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES :<br>LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☐ YES ☐ NO PLASTICITY INDEX → | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-77
Lab No. 0981123-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-8 (TP2011-FD13)
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | 100 | |
| 4 | 84 | |
| 3 | 77 | |
| 2 | 59 | |
| 1 1/2 | 51 | |
| 1 | 42 | |
| 3/4 | 39 | |
| 1/2 | 34 | |
| 3/8 | 33 | |
| 1/4 | 31 | |
| No.4 | 30 | |
| 8 | 27 | |
| 10 | 27 | |
| 16 | 25 | |
| 30 | 22 | |
| 40 | 21 | |
| 50 | 19 | |
| 100 | 16 | |
| 200 | 12 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | RESULTS | SPECS |
|---|---|---|---|
| UNIT WEIGHT & VOIDS<br>☐ ASTM C29 ☐ AASHTO T19<br>☐ RODDING ☐ JIGGING ☐ LOOSE | FINE AGGREGATE UNIT WEIGHT, PCF → | | |
| | VOIDS, % → | | |
| | COARSE AGGREGATE UNIT WEIGHT, PCF → | | |
| | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION<br>FINE AGGREGATE<br>☐ ASTM C128 ☐ AASHTO T84<br>AGGREGATE DRIED<br>☐ YES ☐ NO | BULK SPECIFIC GRAVITY → | | |
| | BULK SPECIFIC GRAVITY (SSD) → | | |
| | APPARENT SPECIFIC GRAVITY → | | |
| | ABSORPTION, % → | | |
| COARSE AGGREGATE<br>☐ ASTM C127 ☒ AASHTO T85<br>AGGREGATE DRIED<br>☒ YES ☐ NO | BULK SPECIFIC GRAVITY → | 2.641 | |
| | BULK SPECIFIC GRAVITY (SSD) → | 2.594 | |
| | APPARENT SPECIFIC GRAVITY → | 2.684 | |
| | ABSORPTION, % → | 2.1 | |
| SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION<br>SMALL COARSE AGGREGATE<br>☐ ASTM C131 ☐ AASHTO T96 | GRADING 100 REV., %LOSS → | | |
| | GRADING 500 REV., %LOSS → | | |
| LARGE COARSE AGGREGATE<br>☐ ASTM C535 | GRADING 200 REV., %LOSS → | | |
| | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES<br>☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES<br>☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT<br>☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX<br>☐ ASTM D3744 ☐ AASHTO T210<br>PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_c$ → | | |
| | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT<br>☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF AGGREGATES

Date of Report 11-29-11
Job No. 3151JM098
Event / Invoice No. 31510186-75 Lab No. 0981123-6
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119
/

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material VARIABLE
Sample Source / Location TP-E5 (TP2011-FD15)
Testing Authorized :
Special Instructions :

Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source BORING
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☒ CP-31
FINER THAN #200 ☐ ASTM C117 ☒ CP-31

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 63 | |
| 1 1/2 | 47 | |
| 1 | 29 | |
| 3/4 | 24 | |
| 1/2 | 19 | |
| 3/8 | 17 | |
| 1/4 | 16 | |
| No.4 | 15 | |
| 8 | 14 | |
| 10 | 13 | |
| 16 | 12 | |
| 30 | 11 | |
| 40 | 10 | |
| 50 | 9 | |
| 100 | 7 | |
| 200 | 5.4 | |

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

| | RESULTS | SPECS |
|---|---|---|
| LIQUID LIMIT → | | |
| PLASTIC LIMIT → | | |
| PLASTICITY INDEX → | | |
| FINENESS MODULUS<br>☐ ASTM C125 → | | |
| ORGANIC IMPURITIES<br>☐ ASTM C40<br>☐ AASHTO T21 PLATE NO. → | | |
| CLEANNESS VALUE<br>☐ CA 227 → | | |

| PHYSICAL PROPERTIES | | | RESULTS | SPECS |
|---|---|---|---|---|
| UNIT WEIGHT & VOIDS | ☐ ASTM C29 ☐ AASHTO T19 | FINE AGGREGATE UNIT WEIGHT, PCF → | | |
| | | VOIDS, % → | | |
| | ☐ RODDING ☐ JIGGING ☐ LOOSE | COARSE AGGREGATE UNIT WEIGHT, PCF → | | |
| | | VOIDS, % → | | |
| SPECIFIC GRAVITY & ABSORPTION | FINE AGGREGATE | BULK SPECIFIC GRAVITY → | | |
| | ☐ ASTM C128 ☐ AASHTO T84 | BULK SPECIFIC GRAVITY (SSD) → | | |
| | AGGREGATE DRIED | APPARENT SPECIFIC GRAVITY → | | |
| | ☐ YES ☐ NO | ABSORPTION, % → | | |
| | COARSE AGGREGATE | BULK SPECIFIC GRAVITY → | 2.589 | |
| | ☐ ASTM C127 ☒ AASHTO T85 | BULK SPECIFIC GRAVITY (SSD) → | 2.621 | |
| | AGGREGATE DRIED | APPARENT SPECIFIC GRAVITY → | 2.676 | |
| | ☒ YES ☐ NO | ABSORPTION, % → | 1.3 | |
| SAND EQUIVALENT VALUE | ☐ ASTM D2419 ☐ AASHTO T176 | SE, % → | | |
| RESISTANCE TO DEGRADATION | SMALL COARSE AGGREGATE | GRADING 100 REV., %LOSS → | | |
| | ☐ ASTM C131 ☐ AASHTO T96 | GRADING 500 REV., %LOSS → | | |
| | LARGE COARSE AGGREGATE | GRADING 200 REV., %LOSS → | | |
| | ☐ ASTM C535 | GRADING 1000 REV., %LOSS → | | |
| LIGHTWEIGHT PIECES | ☐ ASTM C123 ☐ AASHTO T113 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| CLAY LUMPS & FRIABLE PARTICLES | ☐ ASTM C142 ☐ AASHTO T112 | FINE AGGREGATE, % → | | |
| | | COARSE AGGREGATE, % → | | |
| FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT | ☐ AZ 212 ☐ FLH T507 ☐ FAA | ONE OR MORE FACES, % → | | |
| | | TWO OR MORE FACES, % → | | |
| DURABILITY INDEX | ☐ ASTM D3744 ☐ AASHTO T210 | $D_c$ → | | |
| | PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE | $D_f$ → | | |
| UNCOMPACTED VOID CONTENT | ☐ AZ 247 ☐ ASTM C1252 METHOD | VC, % → | | |

Comments :

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-106 Lab No. 0981104-1
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material 4" MINUS SILTY CLAYEY SAND W/GRAV.
Sample Source / Location TP-1 (TP2011-AT1)
Testing Authorized :
Special Instructions :

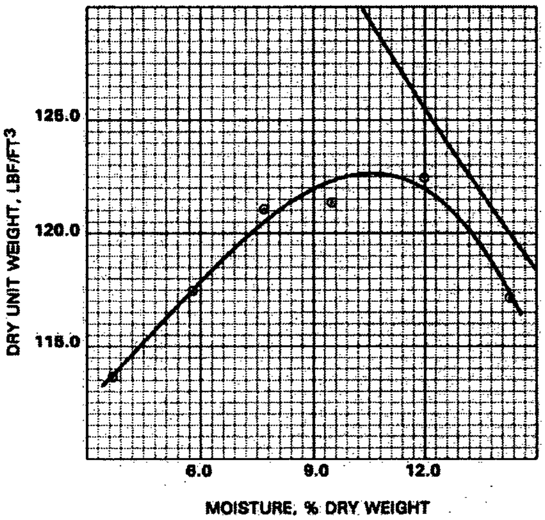
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source EXISTING SUBGRADE
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 96 | |
| 2 | 96 | |
| 1 1/2 | 94 | |
| 1 | 89 | |
| 3/4 | 86 | |
| 1/2 | 81 | |
| 3/8 | 77 | |
| 1/4 | 70 | |
| No.4 | 68 | |
| 8 | 55 | |
| 10 | 55 | |
| 16 | 48 | |
| 30 | 41 | |
| 40 | 38 | |
| 50 | 35 | |
| 100 | 28 | |
| 200 | 23 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 42
MAXIMUM DENSITY, LBF/FT$^3$ → 122.6
OPTIMUM MOISTURE CONTENT, % → 10.5

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 14

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 127.2
CORR. OPTIMUM MOISTURE, % 9.2

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 | | |
| METHOD 8 LIQUID LIMIT → | 24 | |
| ESTIMATED % RETAINED ON NO. 40 62 PLASTIC LIMIT → | 18 | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 6 | |
| MOISTURE CONTENT : | | |
| PORTION TESTED % DRY WEIGHT → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| SPECIFIC GRAVITY : | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| pH DETERMINATION : | | |
| pH → | | |
| SOLUBLE SALTS : | | |
| PPM → | | |
| MINIMUM RESISTIVITY : | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: SC-SM
NAME: SILTY, CLAYEY SAND WITH GRAVEL

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-07-11
Job No. 3151JM098
Event / Invoice No. 31510186-95 Lab No. 0981129-2
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material 3" MINUS SILTY GRAVEL WITH SAND
Sample Source / Location TP-2 (TP2011-AT2)
Testing Authorized :
Special Instructions :

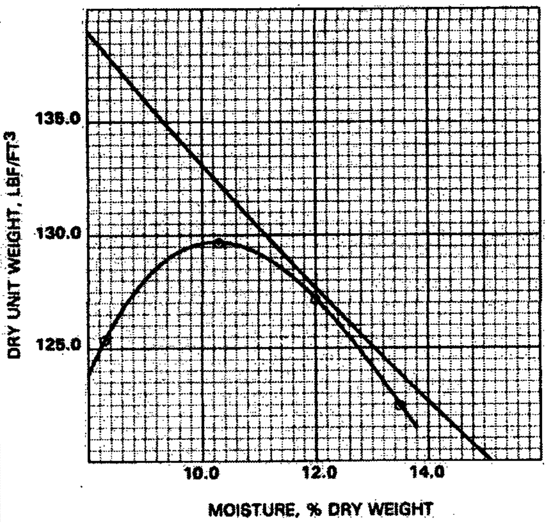
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source EXISTING SUBGRADE
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 90 | |
| 1 1/2 | 84 | |
| 1 | 77 | |
| 3/4 | 72 | |
| 1/2 | 66 | |
| 3/8 | 64 | |
| 1/4 | 58 | |
| No.4 | 54 | |
| 8 | 45 | |
| 10 | 42 | |
| 16 | 37 | |
| 30 | 31 | |
| 40 | 28 | |
| 50 | 25 | |
| 100 | 21 | |
| 200 | 17 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 38
MAXIMUM DENSITY, LBF/FT$^3$ → 129.7
OPTIMUM MOISTURE CONTENT, % → 10.2

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 28

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.71

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 138.0
CORR. OPTIMUM MOISTURE, % 7.6

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| LIQUID & PLASTIC PROPERTIES : ASTM D4318 | | |
| METHOD B LIQUID LIMIT → | 21 | |
| ESTIMATED % RETAINED ON NO. 40 72 PLASTIC LIMIT → | 0 | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | NP | |
| MOISTURE CONTENT : | | |
| PORTION TESTED % DRY WEIGHT → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | |
| SURCHARGE, KSF | | |
| INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : | | |
| GRADING 100 REV, % LOSS → | | |
| GRADING 500 REV, % LOSS → | | |
| SPECIFIC GRAVITY : | | |
| MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| pH DETERMINATION : | | |
| pH → | | |
| SOLUBLE SALTS : | | |
| PPM → | | |
| MINIMUM RESISTIVITY : | | |
| OHM-CM → | | |

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: GM
NAME: SILTY GRAVEL WITH SAND

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report 12-07-11
Job No. 3151JM098
Event / Invoice No. 31510186-96 Lab No. 0981104-3
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Contractor FLARE CONSTRUCTION
Type / Use of Material 3' MINUS SILTY GRAVEL WITH SAND
Sample Source / Location TP-3 (TP2011-AT3)
Testing Authorized :
Special Instructions :

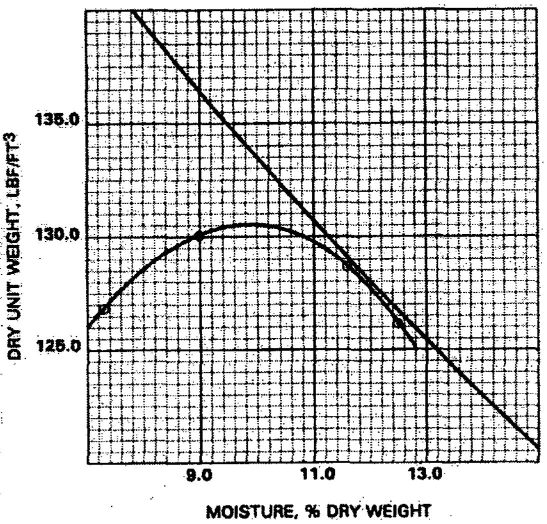
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source EXISTING SUBGRADE
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | 100 | |
| 2 | 98 | |
| 1 1/2 | 95 | |
| 1 | 88 | |
| 3/4 | 82 | |
| 1/2 | 81 | |
| 3/8 | 65 | |
| 1/4 | 56 | |
| No.4 | 51 | |
| 8 | 39 | |
| 10 | 38 | |
| 16 | 31 | |
| 30 | 26 | |
| 40 | 24 | |
| 50 | 21 | |
| 100 | 17 | |
| 200 | 13 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 12
MAXIMUM DENSITY, LBF/FT$^3$ → 130.5
*OPTIMUM MOISTURE CONTENT, % →* 9.8

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 18

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.72

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 135.6
CORR. OPTIMUM MOISTURE, % 8.2

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90<br>METHOD B LIQUID LIMIT →<br>ESTIMATED % RETAINED ON NO. 40 77 PLASTIC LIMIT →<br>SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | NP | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF →<br>SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | |

| TEST PROCEDURE | RESULT | SPECS |
|---|---|---|
| RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :<br>GRADING 100 REV, % LOSS →<br>GRADING 500 REV, % LOSS → | | |
| SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| pH DETERMINATION :<br>pH → | | |
| SOLUBLE SALTS :<br>PPM → | | |
| MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : ASTM D2487 GROUP SYMBOL: GM
NAME: SILTY GRAVEL WITH SAND

Comments :

Copies to : CLIENT (1)

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Since 1955

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-07-11
Job No. 3151JM098
Event / Invoice No. 31510186-97 Lab No. 0981104-4
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project *RICO INITIAL SOLIDS REMOVAL AND DRYING*
Contractor FLARE CONSTRUCTION
Type / Use of Material 4' MINUS SILTY GRAVEL WITH SAND
Sample Source / Location TP-5 (TP2011-AT5)
Testing Authorized :
Special Instructions :

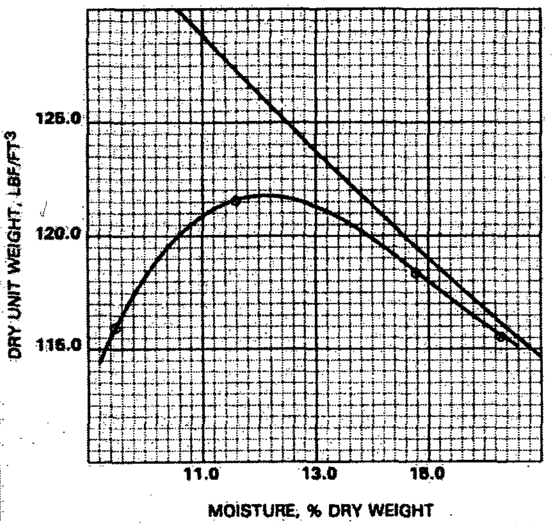
Location RICO, COLORADO
Arch. / Engr. ANDERSON ENGINEERING
Supplier / Source EXISTING GROUND
Source / Location Desig. By CLIENT Date 10-21-11

## TEST RESULTS

**SIEVE ANALYSIS : ASTM C136**
**FINER THAN NO. 200 : ASTM C117**

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 89 | |
| 2 | 86 | |
| 1 1/2 | 81 | |
| 1 | 72 | |
| 3/4 | 67 | |
| 1/2 | 62 | |
| 3/8 | 58 | |
| 1/4 | 53 | |
| No.4 | 50 | |
| 8 | 44 | |
| 10 | 43 | |
| 16 | 39 | |
| 30 | 35 | |
| 40 | 32 | |
| 50 | 30 | |
| 100 | 25 | |
| 200 | 19 | |

**LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C**



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 16
MAXIMUM DENSITY, LBF/FT$^3$ → 121.8
OPTIMUM MOISTURE CONTENT, % → 12.1

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 33

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.67

**CORRECTION OF MAXIMUM UNIT WEIGHT & *OPTIMUM MOISTURE CONTENT FOR OVERSIZE* PARTICLES : ASTM D4718**

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 133.4
CORR. OPTIMUM MOISTURE, % 8.4

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| **LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90** | | | **RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** | | |
| METHOD B LIQUID LIMIT → | 35 | | GRADING 100 REV, % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 68 PLASTIC LIMIT → | 27 | | GRADING 500 REV, % LOSS → | | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 8 | | | | |
| **MOISTURE CONTENT :** PORTION TESTED % DRY WEIGHT → | | | **SPECIFIC GRAVITY :** MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| **EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :** | | | **pH DETERMINATION :** pH → | | |
| ☐ EXPANSION ☐ COMPRESSION, % → | | | **SOLUBLE SALTS :** PPM → | | |
| MAXIMUM SWELL PRESSURE, KSF → | | | **MINIMUM RESISTIVITY :** OHM-CM → | | |
| SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | | | |

**SOIL CLASSIFICATION : ASTM D2487**
GROUP SYMBOL: GM
NAME: SILTY GRAVEL WITH SAND

Comments :

Copies to : CLIENT (1)

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# PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Date of Report 12-09-11
Job No. 3151JM098
Event / Invoice No. 31510186-107 Lab No. 0981104-5
Authorized by CHRIS SANCHEZ Date 10-21-11
Sampled by CLIENT Date 10-21-11
Submitted by D. SENJEM Date 10-31-11

Client **ANDERSON ENGINEERING**
**977 WEST 2100 SOUTH**
**SALT LAKE CITY, UT 84119**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **3" MINUS CLAYEY GRAVEL WITH SAND**
Sample Source / Location **TP-6 (TP2011-AT6)**
Testing Authorized :
Special Instructions :

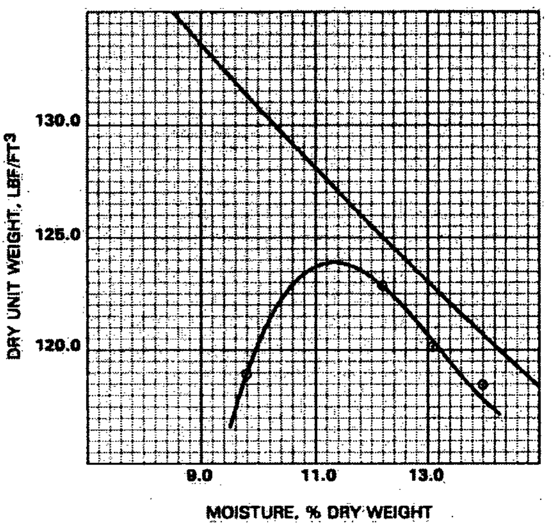
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **EXISTING SUBGRADE**
Source / Location Desig. By **CLIENT** Date **10-21-11**

## TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

| SIEVE | ACCUMULATIVE % PASSING | SPECIFICATION |
|---|---|---|
| 6 | | |
| 5 | | |
| 4 | 100 | |
| 3 | 98 | |
| 2 | 94 | |
| 1 1/2 | 91 | |
| 1 | 85 | |
| 3/4 | 81 | |
| 1/2 | 74 | |
| 3/8 | 71 | |
| 1/4 | 64 | |
| No.4 | 60 | |
| 8 | 50 | |
| 10 | 49 | |
| 16 | 42 | |
| 30 | 37 | |
| 40 | 34 | |
| 50 | 32 | |
| 100 | 27 | |
| 200 | 22 | |

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: ☒ WET ☐ DRY
RAMMER USED:
☒ 2 IN. CIRCULAR FACE ☐ OTHER
☐ MECHANICAL ☒ MANUAL

PROJECT PROCTOR ID: 41
MAXIMUM DENSITY, LBF/FT$^3$ → 123.9
OPTIMUM MOISTURE CONTENT, % → 11.3

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : 2.65
ASSUMED ABSORPTION, % : 1.0
% OVERSIZE IN LAB SAMPLE : 19

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : 2.65

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT$^3$ 130.1
CORR. OPTIMUM MOISTURE, % 9.3

| TEST PROCEDURE | RESULT | SPECS | TEST PROCEDURE | RESULT | SPECS |
|---|---|---|---|---|---|
| LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 | | | RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : | | |
| METHOD B LIQUID LIMIT → | 32 | | GRADING 100 REV. % LOSS → | | |
| ESTIMATED % RETAINED ON NO. 40 66 PLASTIC LIMIT → | 21 | | GRADING 500 REV. % LOSS → | | |
| SAMPLE AIR DRIED ☒ YES ☐ NO PLASTICITY INDEX → | 11 | | | | |
| MOISTURE CONTENT :<br>PORTION TESTED % DRY WEIGHT → | | | SPECIFIC GRAVITY :<br>MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C → | | |
| EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :<br>☐ EXPANSION ☐ COMPRESSION, % →<br>MAXIMUM SWELL PRESSURE, KSF → | | | pH DETERMINATION :<br>pH → | | |
| | | | SOLUBLE SALTS :<br>PPM → | | |
| SURCHARGE, KSF<br>INITIAL WATER CONTENT, % DRY DENSITY, PCF | | | MINIMUM RESISTIVITY :<br>OHM-CM → | | |

SOIL CLASSIFICATION : ASTM D2487 GROUP SYMBOL: **GC**
NAME: **CLAYEY GRAVEL WITH SAND**

Comments :

Copies to : CLIENT (1)

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# SOIL / AGGREGATE FIELD UNIT WEIGHT TESTS
## (FIELD DENSITY)

Date of Report 12-09-11
Job No. 3151JM098 Page 1 of 1
Event/Invoice No. 31510186-105
Authorized By CLIENT Date 11-03-11
Tested By S. KATZER Date 11-04-11

Client ANDERSON ENGINEERING
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Client ANDERSON ENGINEERING
Project RICO INITIAL SOLIDS REMOVAL AND DRYING
Location RICO, COLORADO
Test Locations Designated By CLIENT
Test Procedures In-Place Unit Weight : ASTM D6938 Moisture Content : ASTM D6938 Rock Correction : ASTM D4718
Gauge : Make TROXLER Model 3411-SP Serial No. 15753 Standard Count: Unit Weight 2114 $H_2O$ 650

| TEST NO. | IN-PLACE CHARACTERISTICS |  |  |  | LAB CHARACTERISTICS |  |  |  |  | COMPACTION | REQUIREMENTS |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Hole Volume cu. ft. | Moisture % of Dry Unit Weight | Dry Unit Weight lbf / cu. ft. | Oversize % | ID | Maximum Dry Unit Weight lbf / cu. ft. TESTED | Maximum Dry Unit Weight lbf / cu. ft. CORRECTED | Optimum Moisture % TESTED | Optimum Moisture % CORRECTED | % of Corrected Maximum Dry Unit Weight | Moisture % | Compaction % | CONFORMANCE INDICATED |
| 1 |  | 14.8 | 109.3 | 19 | 41 | 123.9 | 130.1 | 11.3 | 9.3 | 84 |  |  |  |
| 2 |  | 15.8 | 118.0 | 33 | 16 | 121.8 | 133.4 | 12.1 | 8.4 | 88 |  |  |  |
| 3 |  | 11.7 | 100.8 | 28 | 38 | 129.7 | 138.0 | 10.2 | 7.6 | 73 |  |  |  |
| 4 |  | 12.8 | 97.5 | 14 | 42 | 122.6 | 127.2 | 10.5 | 9.2 | 77 |  |  |  |

| TEST NO. | TEST LOCATION, HORIZONTAL | TEST LOCATION, VERTICAL Approximate Fill Depth, ft. | TEST LOCATION, VERTICAL Elevation * | MATERIAL TESTED |
|---|---|---|---|---|
| 1 | TP-6 (TP2011-AT6) | 0.0 | 100.0 | SUBGRADE |
| 2 | TP-5 (TP2011-AT5) | 0.0 | 100.0 | SUBGRADE |
| 3 | TP-2 (TP2011-AT2) | 0.0 | 100.0 | SUBGRADE |
| 4 | TP-1 (TP2011-AT1) | 0.0 | 100.0 | SUBGRADE |

LABORATORY DATA & COMPACTION CHARACTERISTICS

| LAB ID. | EVENT/ INVOICE NO. | DESCRIPTION OF MATERIAL | SOURCE OF MATERIAL | OPTIMUM MOISTURE, % | MAXIMUM DRY UNIT WEIGHT, lbf / cu. ft. | TEST METHOD |
|---|---|---|---|---|---|---|
| 41 | 31510186-107 | 3" MINUS CLAYEY GRAVEL W/SAND | TP-6 | 11.3 | 123.9 | D698-C |
| 16 | 31510186-97 | 4' MINUS SILTY GRAVEL W/SAND | TP-5 | 12.1 | 121.8 | D698-C |
| 38 | 31510186-95 | 3' MINUS SILTY GRAVEL W/ SAND | TP-2 | 10.2 | 129.7 | D698-C |
| 42 | 31510186-106 | SILTY CLAYEY SAND WITH GRAVEL | TP-1 | 10.5 | 122.6 | D698-C |

Comments: SPECIFICATION UNKNOWN FOR COMPACTION AND MOISTURE CONTENT.
* DATUM 100' = TOP OF EXISTING GROUND
This engagement does NOT include provision for WT opinions, conclusions nor directions in regard to this project.

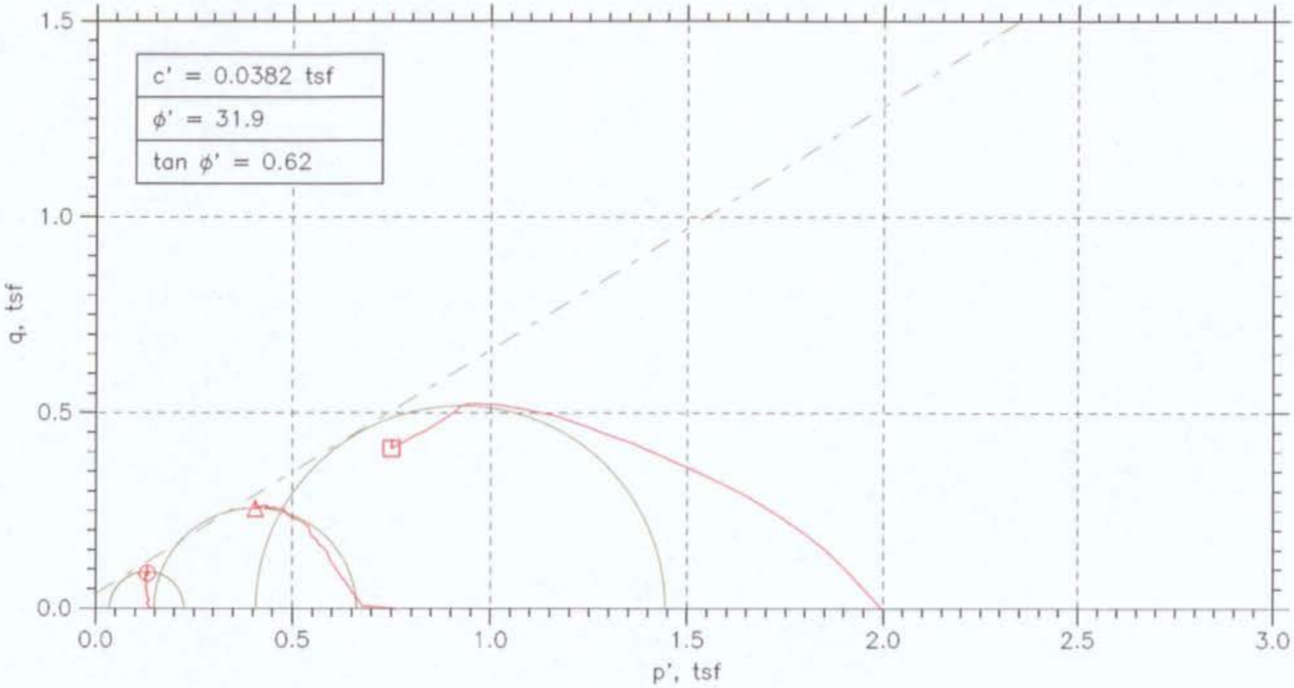
Distribution : CLIENT (1)

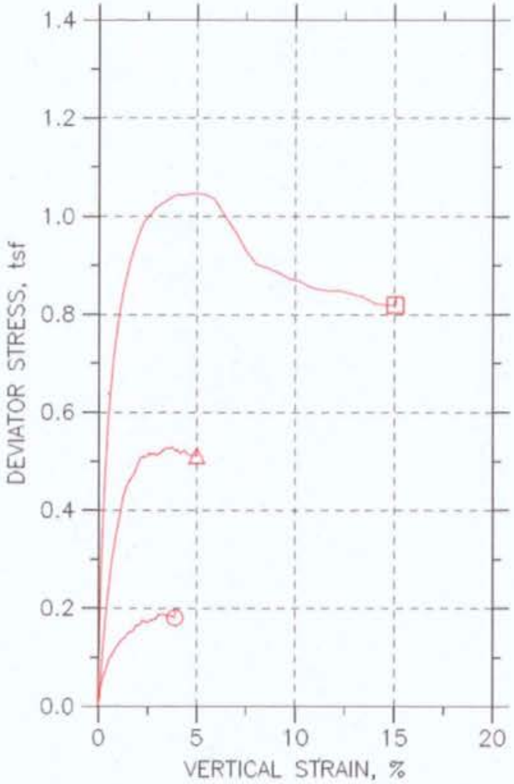
TESTING WAS PERFORMED PER LOCAL INDUSTRY PRACTICES THAT MAY INCLUDE SLIGHT DEVIATIONS FROM THE STANDARDS.

TESTS REPORTED HEREIN ARE INDICATIVE OF CONDITIONS FOUND AT THE EXACT LOCATION AND TIME OF TESTING ONLY. THE ABOVE SERVICES AND REPORT WERE PERFORMED PURSUANT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN WT AND CLIENT. WT WARRANTS THAT THIS WAS PERFORMED UNDER THE STANDARD OF REASONABLE CARE APPLICABLE TO SUCH TESTING GENERALLY. NO OTHER WARRANTY GUARANTY, OR REPRESENTATION, EXPRESSED OR IMPLIED, IS INCLUDED OR INTENDED.

REVIEWED BY P. APPEL
(SIGNED COPY ON FILE)

# TRIAXIAL COMPRESSION TEST REPORT





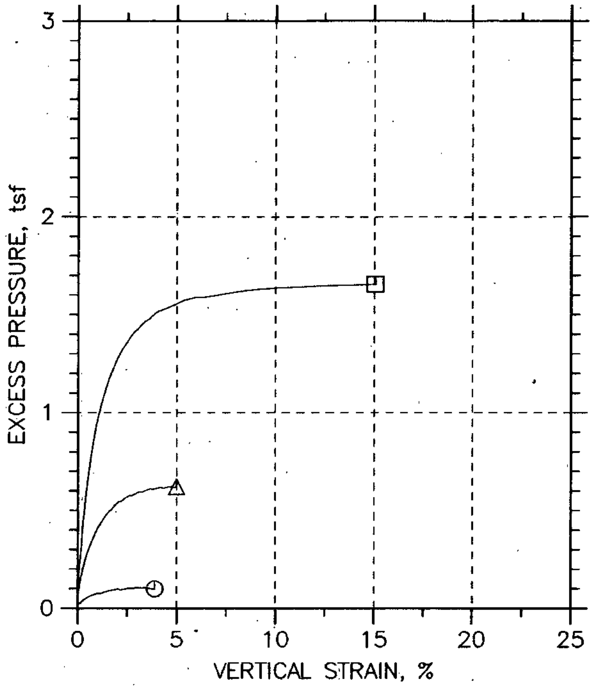
| | Symbol | ○ | △ | □ | |
|---|---|---|---|---|---|
| | Test No. | 2 PSI | 11.1 PSI | 12 PSI | |
| Initial | Diameter, in | 2.8287 | 2.8621 | 2.8709 | |
| | Height, in | 5.9118 | 5.4677 | 4.6028 | |
| | Water Content, % | 244.32 | 220.26 | 192.30 | |
| | Dry Density, pcf | 21.91 | 24.38 | 27.56 | |
| | Saturation, % | 97.15 | 98.90 | 99.59 | |
| | Void Ratio | 7.5294 | 6.6679 | 5.781 | |
| Before Shear | Water Content, % | 220.26 | 192.30 | 170.69 | |
| | Dry Density, pcf | 24.61 | 27.66 | 30.59 | |
| | Saturation, % | 100.00 | 100.00 | 100.00 | |
| | Void Ratio | 6.5946 | 5.7575 | 5.1104 | |
| | Back Press., tsf | 5.0422 | 5.066 | 5.0438 | |
| | Minor Prin. Stress, tsf | 0.14184 | 0.77317 | 1.9978 | |
| | Max. Dev. Stress, tsf | 0.18932 | 0.53003 | 1.0484 | |
| | Time to Failure, min | 240 | 245 | 270 | |
| | Strain Rate, %/min | 0.02 | 0.02 | 0.02 | |
| | B-Value | .99 | --- | --- | |
| | Estimated Specific Gravity | 2.99 | 2.99 | 2.99 | |
| | Liquid Limit | 73 | 73 | 73 | |
| | Plastic Limit | 50 | 50 | 50 | |
| | Plasticity Index | 23 | 23 | 23 | |
| | Failure Sketch |  |  |  | |

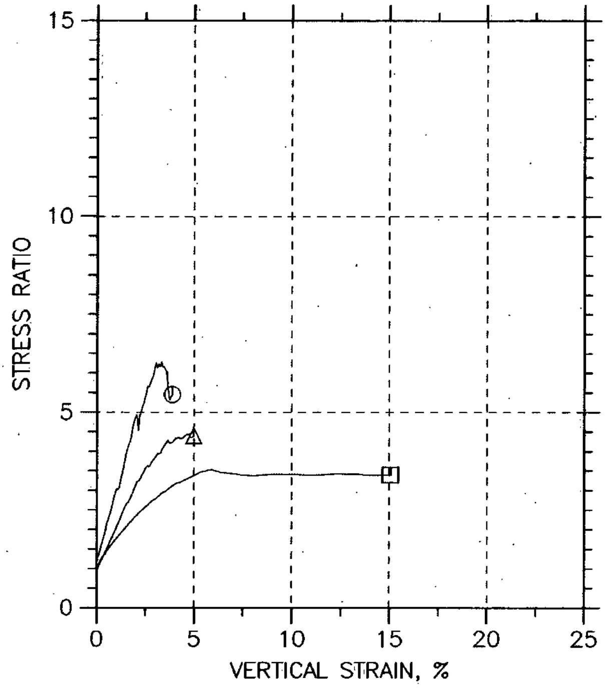
Project: RICO ARGENTINE SIT OU01
Location: RICO, CO
Project No.: 60157757
ring No.: ST-2
Sample Type: 3 " ST
Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

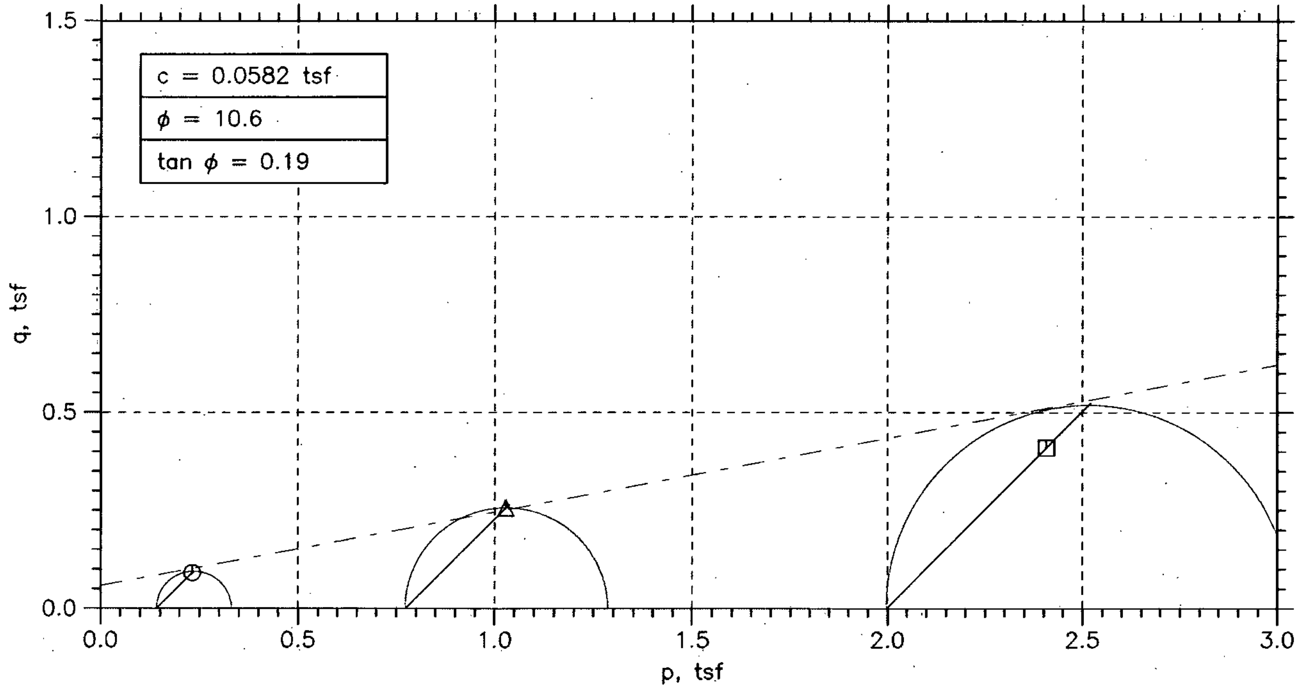
Thu, 01-DEC-2011 13:36:50

# TRIAXIAL COMPRESSION TEST REPORT

AECOM







| | | |
|---|---|---|
| Project: RICO ARGENTINE SIT OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-2 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-2 | Test Date: 11/22/11 | Depth: 2.0'-4.0 |
| st No.: ST-2 | Sample Type: 3 " ST | Elevation: ---- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST | | |
| Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767 | | |
| | | |

Thu, 01-DEC-2011 13:37:40

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO ARGENTINE SIT OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-2 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-2 | Test Date: 11/22/11 | Depth: 2.0'-4.0 |
| Test No.: ST-2 | Sample Type: 3 " ST | Elevation: ---- |

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

| | | |
|---|---|---|
| Specimen Height: 5.91 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.28 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 37.15 in^3 | Piston Weight: 0.00 lb | Correction Type: Uniform |
| Liquid Limit: 73 | Plastic Limit: 50 | Estimated Specific Gravity: 2.99 |

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.2846 | 0 | 0 | 5.0422 | 5.184 | 5.184 |
| 2 | 2.004 | 0.026104 | 6.2862 | 1.7469 | 0.020008 | 5.0616 | 5.184 | 5.204 |
| 3 | 4.004 | 0.053744 | 6.288 | 2.3292 | 0.02667 | 5.0666 | 5.184 | 5.2107 |
| 4 | 6.0041 | 0.081384 | 6.2897 | 2.9115 | 0.033328 | 5.0699 | 5.184 | 5.2173 |
| 5 | 8.0041 | 0.11056 | 6.2915 | 3.3349 | 0.038165 | 5.0683 | 5.184 | 5.2222 |
| 6 | 10.004 | 0.1382 | 6.2933 | 3.6526 | 0.041788 | 5.0677 | 5.184 | 5.2258 |
| 7 | 12.004 | 0.16584 | 6.295 | 4.076 | 0.04662 | 5.0721 | 5.184 | 5.2306 |
| 8 | 14 | 0.19348 | 6.2968 | 4.3937 | 0.050239 | 5.0755 | 5.184 | 5.2342 |
| 9 | 16 | 0.22112 | 6.2985 | 4.7642 | 0.054461 | 5.0783 | 5.184 | 5.2385 |
| 10 | 18 | 0.24876 | 6.3002 | 5.2406 | 0.05989 | 5.0805 | 5.184 | 5.2439 |
| 11 | 20 | 0.2764 | 6.302 | 5.6112 | 0.064107 | 5.0832 | 5.184 | 5.2481 |
| 12 | 22 | 0.30404 | 6.3037 | 5.77 | 0.065903 | 5.0855 | 5.184 | 5.2499 |
| 13 | 24 | 0.33168 | 6.3055 | 6.1405 | 0.070116 | 5.0877 | 5.184 | 5.2541 |
| 14 | 26 | 0.36086 | 6.3073 | 6.4052 | 0.073117 | 5.0894 | 5.184 | 5.2571 |
| 15 | 28 | 0.39003 | 6.3092 | 6.6699 | 0.076116 | 5.091 | 5.184 | 5.2601 |
| 16 | 30 | 0.41767 | 6.3109 | 6.9875 | 0.079719 | 5.0932 | 5.184 | 5.2637 |
| 17 | 35 | 0.48523 | 6.3152 | 7.6757 | 0.08751 | 5.0977 | 5.184 | 5.2715 |
| 18 | 40.001 | 0.55587 | 6.3197 | 8.6285 | 0.098304 | 5.1016 | 5.184 | 5.2823 |
| 19 | 45.001 | 0.62651 | 6.3242 | 8.8932 | 0.10125 | 5.1049 | 5.184 | 5.2852 |
| 20 | 50.001 | 0.69561 | 6.3286 | 9.2637 | 0.10539 | 5.1082 | 5.184 | 5.2894 |
| 21 | 55.001 | 0.76471 | 6.333 | 9.7402 | 0.11074 | 5.111 | 5.184 | 5.2947 |
| 22 | 60.001 | 0.83534 | 6.3375 | 10.058 | 0.11427 | 5.1138 | 5.184 | 5.2983 |
| 23 | 65.001 | 0.90598 | 6.342 | 10.746 | 0.122 | 5.1166 | 5.184 | 5.306 |
| 24 | 70.001 | 0.97508 | 6.3465 | 11.064 | 0.12551 | 5.1188 | 5.184 | 5.3095 |
| 25 | 75.001 | 1.0457 | 6.351 | 11.381 | 0.12903 | 5.121 | 5.184 | 5.313 |
| 26 | 80.001 | 1.1148 | 6.3554 | 11.752 | 0.13313 | 5.1182 | 5.184 | 5.3171 |
| 27 | 85.001 | 1.1854 | 6.36 | 11.911 | 0.13484 | 5.1193 | 5.184 | 5.3188 |
| 28 | 90.001 | 1.2545 | 6.3644 | 12.334 | 0.13953 | 5.1227 | 5.184 | 5.3235 |
| 29 | 95.002 | 1.3236 | 6.3689 | 12.44 | 0.14063 | 5.1255 | 5.184 | 5.3246 |
| [illegible] | 100 | 1.3927 | 6.3733 | 12.705 | 0.14352 | 5.1277 | 5.184 | 5.3275 |
| [illegible] | 105 | 1.4618 | 6.3778 | 13.075 | 0.14761 | 5.1299 | 5.184 | 5.3316 |
| 32 | 110 | 1.5325 | 6.3824 | 13.446 | 0.15168 | 5.1321 | 5.184 | 5.3357 |
| 33 | 115 | 1.6016 | 6.3869 | 13.604 | 0.15336 | 5.1338 | 5.184 | 5.3374 |
| 34 | 120 | 1.6707 | 6.3914 | 13.657 | 0.15385 | 5.1354 | 5.184 | 5.3379 |
| 35 | 125 | 1.7413 | 6.3959 | 13.763 | 0.15493 | 5.1366 | 5.184 | 5.3389 |
| 36 | 130 | 1.8104 | 6.4005 | 13.975 | 0.15721 | 5.1377 | 5.184 | 5.3412 |
| 37 | 135 | 1.8795 | 6.405 | 14.557 | 0.16364 | 5.1388 | 5.184 | 5.3476 |
| 38 | 140 | 1.9502 | 6.4096 | 14.822 | 0.1665 | 5.1399 | 5.184 | 5.3505 |
| 39 | 145 | 2.0177 | 6.414 | 14.822 | 0.16638 | 5.141 | 5.184 | 5.3504 |
| 40 | 150 | 2.0884 | 6.4186 | 14.928 | 0.16745 | 5.1416 | 5.184 | 5.3515 |
| 41 | 155 | 2.1575 | 6.4232 | 15.193 | 0.1703 | 5.136 | 5.184 | 5.3543 |
| 42 | 160 | 2.2281 | 6.4278 | 15.828 | 0.17729 | 5.1388 | 5.184 | 5.3613 |
| 43 | 165 | 2.2972 | 6.4323 | 15.563 | 0.1742 | 5.1404 | 5.184 | 5.3582 |
| 44 | 170 | 2.3678 | 6.437 | 15.51 | 0.17349 | 5.1421 | 5.184 | 5.3575 |
| 45 | 175 | 2.4385 | 6.4417 | 15.457 | 0.17277 | 5.1432 | 5.184 | 5.3568 |
| 46 | 180 | 2.5076 | 6.4462 | 15.457 | 0.17265 | 5.1443 | 5.184 | 5.3566 |
| 47 | 185 | 2.5782 | 6.4509 | 15.722 | 0.17548 | 5.1449 | 5.184 | 5.3595 |
| 48 | 190 | 2.6473 | 6.4555 | 15.881 | 0.17712 | 5.146 | 5.184 | 5.3611 |
| 49 | 195 | 2.7179 | 6.4602 | 15.881 | 0.17699 | 5.146 | 5.184 | 5.361 |
| 50 | 200 | 2.7886 | 6.4649 | 15.987 | 0.17804 | 5.1466 | 5.184 | 5.362 |
| 51 | 205 | 2.8577 | 6.4695 | 16.092 | 0.1791 | 5.1471 | 5.184 | 5.3631 |
| 52 | 210 | 2.9283 | 6.4742 | 16.092 | 0.17897 | 5.1477 | 5.184 | 5.363 |
| 53 | 215 | 2.9989 | 6.4789 | 16.622 | 0.18472 | 5.1477 | 5.184 | 5.3687 |
| 54 | 220 | 3.0696 | 6.4836 | 16.992 | 0.1887 | 5.1482 | 5.184 | 5.3727 |
| 55 | 225 | 3.1387 | 6.4882 | 16.834 | 0.1868 | 5.1477 | 5.184 | 5.3708 |
| 56 | 230 | 3.2108 | 6.4931 | 16.886 | 0.18725 | 5.1482 | 5.184 | 5.3712 |
| 57 | 235 | 3.2815 | 6.4978 | 16.939 | 0.1877 | 5.1477 | 5.184 | 5.3717 |
| 58 | 240 | 3.3521 | 6.5025 | 17.098 | 0.18932 | 5.1482 | 5.184 | 5.3733 |
| 59 | 245 | 3.4212 | 6.5072 | 16.939 | 0.18743 | 5.1477 | 5.184 | 5.3714 |
| 60 | 250 | 3.4918 | 6.512 | 16.992 | 0.18788 | 5.1477 | 5.184 | 5.3719 |
| 61 | 255 | 3.5609 | 6.5166 | 16.992 | 0.18774 | 5.1471 | 5.184 | 5.3717 |
| 62 | 260 | 3.6331 | 6.5215 | 16.834 | 0.18585 | 5.1471 | 5.184 | 5.3698 |
| 63 | 265 | 3.7022 | 6.5262 | 16.728 | 0.18455 | 5.1438 | 5.184 | 5.3685 |
| 64 | 270 | 3.7729 | 6.531 | 16.886 | 0.18616 | 5.141 | 5.184 | 5.3702 |
| 65 | 275 | 3.8435 | 6.5358 | 16.728 | 0.18428 | 5.1421 | 5.184 | 5.3683 |
| 66 | 279.67 | 3.9095 | 6.5403 | 16.516 | 0.18182 | 5.1432 | 5.184 | 5.3658 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SIT OU01
Boring No.: ST-2
Sample No.: ST-2
Test No.: ST-2

Location: RICO, CO
Tested By: BCM
Test Date: 11/22/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

Sp[illegible]men Height: 5.91 in
Specimen Area: 6.28 in^2
Specimen Volume: 37.15 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.184 | 5.184 | 0 | 0.000 | 0.14184 | 0.14184 | 1.000 | 0.14184 | 0 |
| 2 | 0.03 | 5.204 | 5.184 | 0.019436 | 0.971 | 0.14242 | 0.12241 | 1.163 | 0.13241 | 0.010004 |
| 3 | 0.05 | 5.2107 | 5.184 | 0.024433 | 0.916 | 0.14408 | 0.11741 | 1.227 | 0.13074 | 0.013335 |
| 4 | 0.08 | 5.2173 | 5.184 | 0.027765 | 0.833 | 0.14741 | 0.11408 | 1.292 | 0.13074 | 0.016664 |
| 5 | 0.11 | 5.2222 | 5.184 | 0.026099 | 0.684 | 0.15391 | 0.11574 | 1.330 | 0.13483 | 0.019082 |
| 6 | 0.14 | 5.2258 | 5.184 | 0.025544 | 0.611 | 0.15809 | 0.1163 | 1.359 | 0.13719 | 0.020894 |
| 7 | 0.17 | 5.2306 | 5.184 | 0.029986 | 0.643 | 0.15848 | 0.11186 | 1.417 | 0.13517 | 0.02331 |
| 8 | 0.19 | 5.2342 | 5.184 | 0.033318 | 0.663 | 0.15876 | 0.10853 | 1.463 | 0.13364 | 0.02512 |
| 9 | 0.22 | 5.2385 | 5.184 | 0.036095 | 0.663 | 0.16021 | 0.10575 | 1.515 | 0.13298 | 0.02723 |
| 10 | 0.25 | 5.2439 | 5.184 | 0.038316 | 0.640 | 0.16342 | 0.10353 | 1.578 | 0.13347 | 0.029945 |
| 11 | 0.28 | 5.2481 | 5.184 | 0.041092 | 0.641 | 0.16486 | 0.10075 | 1.636 | 0.1328 | 0.032054 |
| 12 | 0.30 | 5.2499 | 5.184 | 0.043314 | 0.657 | 0.16443 | 0.09853 | 1.669 | 0.13148 | 0.032952 |
| 13 | 0.33 | 5.2541 | 5.184 | 0.045535 | 0.649 | 0.16642 | 0.096308 | 1.728 | 0.13137 | 0.035058 |
| 14 | 0.36 | 5.2571 | 5.184 | 0.047201 | 0.646 | 0.16776 | 0.094643 | 1.773 | 0.1312 | 0.036559 |
| 15 | 0.39 | 5.2601 | 5.184 | 0.048867 | 0.642 | 0.16909 | 0.092977 | 1.819 | 0.13103 | 0.038058 |
| 16 | 0.42 | 5.2637 | 5.184 | 0.051088 | 0.641 | 0.17047 | 0.090755 | 1.878 | 0.13061 | 0.039859 |
| 17 | 0.49 | 5.2715 | 5.184 | 0.05553 | 0.635 | 0.17382 | 0.086313 | 2.014 | 0.13007 | 0.043755 |
| 18 | 0.56 | 5.2823 | 5.184 | 0.059417 | 0.604 | 0.18073 | 0.082426 | 2.193 | 0.13158 | 0.049152 |
| 19 | 0.63 | 5.2852 | 5.184 | 0.062749 | 0.620 | 0.18034 | 0.079094 | 2.280 | 0.12972 | 0.050624 |
| 20 | 0.70 | 5.2894 | 5.184 | 0.066081 | 0.627 | 0.18115 | 0.075762 | 2.391 | 0.12846 | 0.052696 |
| 21 | 0.76 | 5.2947 | 5.184 | 0.068858 | 0.622 | 0.18372 | 0.072986 | 2.517 | 0.12835 | 0.055368 |
| 22 | 0.84 | 5.2983 | 5.184 | 0.071634 | 0.627 | 0.18447 | 0.070209 | 2.628 | 0.12734 | 0.057133 |
| 23 | 0.91 | 5.306 | 5.184 | 0.074411 | 0.610 | 0.18943 | 0.067433 | 2.809 | 0.12843 | 0.060998 |
| 24 | 0.98 | 5.3095 | 5.184 | 0.076632 | 0.611 | 0.19073 | 0.065211 | 2.925 | 0.12797 | 0.062757 |
| 25 | 1.05 | 5.313 | 5.184 | 0.078853 | 0.611 | 0.19202 | 0.06299 | 3.048 | 0.1275 | 0.064513 |
| 26 | 1.11 | 5.3171 | 5.184 | 0.076077 | 0.571 | 0.1989 | 0.065767 | 3.024 | 0.13233 | 0.066567 |
| 27 | 1.19 | 5.3188 | 5.184 | 0.077187 | 0.572 | 0.19949 | 0.064656 | 3.085 | 0.13207 | 0.067418 |
| 28 | 1.25 | 5.3235 | 5.184 | 0.080519 | 0.577 | 0.20086 | 0.061324 | 3.275 | 0.13109 | 0.069767 |
| [illegible] | 1.32 | 5.3246 | 5.184 | 0.083296 | 0.592 | 0.19918 | 0.058548 | 3.402 | 0.12886 | 0.070316 |
| [illegible] | 1.39 | 5.3275 | 5.184 | 0.085517 | 0.596 | 0.19985 | 0.056327 | 3.548 | 0.12809 | 0.071762 |
| 31 | 1.46 | 5.3316 | 5.184 | 0.087738 | 0.594 | 0.20171 | 0.054105 | 3.728 | 0.12791 | 0.073803 |
| 32 | 1.53 | 5.3357 | 5.184 | 0.089959 | 0.593 | 0.20357 | 0.051884 | 3.923 | 0.12772 | 0.07584 |
| 33 | 1.60 | 5.3374 | 5.184 | 0.091625 | 0.597 | 0.20358 | 0.050218 | 4.054 | 0.1269 | 0.076682 |
| 34 | 1.67 | 5.3379 | 5.184 | 0.093291 | 0.606 | 0.20241 | 0.048552 | 4.169 | 0.12548 | 0.076927 |
| 35 | 1.74 | 5.3389 | 5.184 | 0.094402 | 0.609 | 0.20238 | 0.047442 | 4.266 | 0.12491 | 0.077467 |
| 36 | 1.81 | 5.3412 | 5.184 | 0.095512 | 0.608 | 0.20354 | 0.046331 | 4.393 | 0.12493 | 0.078604 |
| 37 | 1.88 | 5.3476 | 5.184 | 0.096623 | 0.590 | 0.20886 | 0.04522 | 4.619 | 0.12704 | 0.081821 |
| 38 | 1.95 | 5.3505 | 5.184 | 0.097733 | 0.587 | 0.21061 | 0.04411 | 4.775 | 0.12736 | 0.083249 |
| 39 | 2.02 | 5.3504 | 5.184 | 0.098844 | 0.594 | 0.20938 | 0.042999 | 4.869 | 0.12619 | 0.083192 |
| 40 | 2.09 | 5.3515 | 5.184 | 0.099399 | 0.594 | 0.20989 | 0.042444 | 4.945 | 0.12617 | 0.083726 |
| 41 | 2.16 | 5.3543 | 5.184 | 0.093846 | 0.551 | 0.2183 | 0.047997 | 4.548 | 0.13315 | 0.08515 |
| 42 | 2.23 | 5.3613 | 5.184 | 0.096623 | 0.545 | 0.22251 | 0.04522 | 4.921 | 0.13387 | 0.088646 |
| 43 | 2.30 | 5.3582 | 5.184 | 0.098289 | 0.564 | 0.21776 | 0.043555 | 5.000 | 0.13066 | 0.087102 |
| 44 | 2.37 | 5.3575 | 5.184 | 0.099955 | 0.576 | 0.21537 | 0.041889 | 5.142 | 0.12863 | 0.086743 |
| 45 | 2.44 | 5.3568 | 5.184 | 0.10107 | 0.585 | 0.21355 | 0.040778 | 5.237 | 0.12716 | 0.086385 |
| 46 | 2.51 | 5.3566 | 5.184 | 0.10218 | 0.592 | 0.21231 | 0.039667 | 5.352 | 0.12599 | 0.086323 |
| 47 | 2.58 | 5.3595 | 5.184 | 0.10273 | 0.585 | 0.21459 | 0.039112 | 5.486 | 0.12685 | 0.087738 |
| 48 | 2.65 | 5.3611 | 5.184 | 0.10384 | 0.586 | 0.21512 | 0.038002 | 5.661 | 0.12656 | 0.088561 |
| 49 | 2.72 | 5.361 | 5.184 | 0.10384 | 0.587 | 0.215 | 0.038002 | 5.658 | 0.1265 | 0.088497 |
| 50 | 2.79 | 5.362 | 5.184 | 0.1044 | 0.586 | 0.21549 | 0.037446 | 5.755 | 0.12647 | 0.089022 |
| 51 | 2.86 | 5.3631 | 5.184 | 0.10495 | 0.586 | 0.21599 | 0.036891 | 5.855 | 0.12644 | 0.089548 |
| 52 | 2.93 | 5.363 | 5.184 | 0.10551 | 0.590 | 0.2153 | 0.036336 | 5.925 | 0.12582 | 0.089483 |
| 53 | 3.00 | 5.3687 | 5.184 | 0.10551 | 0.571 | 0.22105 | 0.036336 | 6.084 | 0.12869 | 0.092359 |
| 54 | 3.07 | 5.3727 | 5.184 | 0.10606 | 0.562 | 0.22448 | 0.03578 | 6.274 | 0.13013 | 0.094349 |
| 55 | 3.14 | 5.3708 | 5.184 | 0.10551 | 0.565 | 0.22314 | 0.036336 | 6.141 | 0.12974 | 0.093401 |
| 56 | 3.21 | 5.3712 | 5.184 | 0.10606 | 0.566 | 0.22303 | 0.03578 | 6.233 | 0.12941 | 0.093625 |
| 57 | 3.28 | 5.3717 | 5.184 | 0.10551 | 0.562 | 0.22404 | 0.036336 | 6.166 | 0.13019 | 0.09385 |
| 58 | 3.35 | 5.3733 | 5.184 | 0.10606 | 0.560 | 0.2251 | 0.03578 | 6.291 | 0.13044 | 0.094661 |
| 59 | 3.42 | 5.3714 | 5.184 | 0.10551 | 0.563 | 0.22376 | 0.036336 | 6.158 | 0.13005 | 0.093714 |
| 60 | 3.49 | 5.3719 | 5.184 | 0.10551 | 0.562 | 0.22421 | 0.036336 | 6.171 | 0.13027 | 0.093938 |
| 61 | 3.56 | 5.3717 | 5.184 | 0.10495 | 0.559 | 0.22463 | 0.036891 | 6.089 | 0.13076 | 0.093871 |
| 62 | 3.63 | 5.3698 | 5.184 | 0.10495 | 0.565 | 0.22274 | 0.036891 | 6.038 | 0.12982 | 0.092924 |
| 63 | 3.70 | 5.3685 | 5.184 | 0.10162 | 0.551 | 0.22477 | 0.040223 | 5.588 | 0.1325 | 0.092274 |
| 64 | 3.77 | 5.3702 | 5.184 | 0.098844 | 0.531 | 0.22916 | 0.042999 | 5.329 | 0.13608 | 0.093081 |
| 65 | 3.84 | 5.3683 | 5.184 | 0.099955 | 0.542 | 0.22617 | 0.041889 | 5.399 | 0.13403 | 0.092138 |
| 66 | 3.91 | 5.3658 | 5.184 | 0.10107 | 0.556 | 0.2226 | 0.040778 | 5.459 | 0.13169 | 0.09091 |

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-2 STAGE2 | Tested By: BCM | Checked By: WPQ |
| Sample No.: STAGE 2 | Test Date: 11/28/11 | Depth: 2.0'-4.0' |
| Test No.: 11.1 PSI | Sample Type: 3 " ST | Elevation: ---- |

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

| | | |
|---|---|---|
| Specimen Height: 5.47 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.43 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 35.18 in^3 | Piston Weight: 0.00 lb | Correction Type: Uniform |
| Liquid Limit: 73 | Plastic Limit: 50 | Estimated Specific Gravity: 2.99 |

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.4338 | 0 | 0 | 5.066 | 5.8392 | 5.8392 |
| 2 | 2.0042 | 0.029885 | 6.4357 | 0.95284 | 0.01066 | 5.1349 | 5.8392 | 5.8499 |
| 3 | 4 | 0.05977 | 6.4376 | 1.3234 | 0.014801 | 5.1588 | 5.8392 | 5.854 |
| 4 | 6.0001 | 0.089655 | 6.4396 | 1.5351 | 0.017164 | 5.1704 | 5.8392 | 5.8564 |
| 5 | 8.0001 | 0.11954 | 6.4415 | 3.7055 | 0.041418 | 5.1904 | 5.8392 | 5.8806 |
| 6 | 10 | 0.14942 | 6.4434 | 5.77 | 0.064475 | 5.2093 | 5.8392 | 5.9037 |
| 7 | 12 | 0.18097 | 6.4455 | 7.358 | 0.082194 | 5.2265 | 5.8392 | 5.9214 |
| 8 | 14 | 0.21085 | 6.4474 | 9.1579 | 0.10227 | 5.2421 | 5.8392 | 5.9415 |
| 9 | 16 | 0.24074 | 6.4493 | 10.534 | 0.1176 | 5.2559 | 5.8392 | 5.9568 |
| 10 | 18 | 0.27062 | 6.4513 | 12.069 | 0.1347 | 5.2693 | 5.8392 | 5.9739 |
| 11 | 20 | 0.30051 | 6.4532 | 13.446 | 0.15002 | 5.2815 | 5.8392 | 5.9892 |
| 12 | 22 | 0.33205 | 6.4552 | 14.293 | 0.15942 | 5.2932 | 5.8392 | 5.9986 |
| 13 | 24 | 0.36194 | 6.4572 | 15.616 | 0.17412 | 5.3043 | 5.8392 | 6.0133 |
| 14 | 26 | 0.39182 | 6.4591 | 16.781 | 0.18705 | 5.3154 | 5.8392 | 6.0263 |
| 15 | 28 | 0.42171 | 6.461 | 17.892 | 0.19939 | 5.3259 | 5.8392 | 6.0386 |
| 16 | 30 | 0.45159 | 6.463 | 19.11 | 0.21289 | 5.3359 | 5.8392 | 6.0521 |
| 17 | 35.001 | 0.52797 | 6.4679 | 21.598 | 0.24042 | 5.3603 | 5.8392 | 6.0796 |
| 18 | 40.001 | 0.60268 | 6.4728 | 23.874 | 0.26556 | 5.3792 | 5.8392 | 6.1048 |
| 19 | 45.001 | 0.67573 | 6.4776 | 26.256 | 0.29184 | 5.3964 | 5.8392 | 6.131 |
| 20 | 50.001 | 0.75044 | 6.4824 | 28.215 | 0.31338 | 5.417 | 5.8392 | 6.1526 |
| 21 | 55.001 | 0.82682 | 6.4874 | 29.75 | 0.33017 | 5.4353 | 5.8392 | 6.1694 |
| 22 | 60.001 | 0.90153 | 6.4923 | 31.708 | 0.35165 | 5.4525 | 5.8392 | 6.1908 |
| 23 | 65.001 | 0.97624 | 6.4972 | 33.085 | 0.36663 | 5.4686 | 5.8392 | 6.2058 |
| 24 | 70.001 | 1.051 | 6.5021 | 34.408 | 0.38101 | 5.4836 | 5.8392 | 6.2202 |
| 25 | 75.001 | 1.124 | 6.5069 | 36.102 | 0.39947 | 5.4936 | 5.8392 | 6.2387 |
| 26 | 80.001 | 1.1971 | 6.5117 | 37.584 | 0.41557 | 5.5047 | 5.8392 | 6.2548 |
| 27 | 85.001 | 1.2718 | 6.5167 | 38.908 | 0.42987 | 5.5186 | 5.8392 | 6.2691 |
| 28 | 90.002 | 1.3465 | 6.5216 | 39.861 | 0.44007 | 5.5308 | 5.8392 | 6.2793 |
| 29 | 95.002 | 1.4212 | 6.5266 | 40.76 | 0.44966 | 5.5425 | 5.8392 | 6.2889 |
| [illegible] | 100 | 1.4959 | 6.5315 | 41.449 | 0.45691 | 5.553 | 5.8392 | 6.2961 |
| [illegible] | 105 | 1.5723 | 6.5366 | 41.978 | 0.46238 | 5.563 | 5.8392 | 6.3016 |
| 32 | 110 | 1.647 | 6.5415 | 42.243 | 0.46495 | 5.5669 | 5.8392 | 6.3041 |
| 33 | 115 | 1.72 | 6.5464 | 42.984 | 0.47275 | 5.5747 | 5.8392 | 6.312 |
| 34 | 120 | 1.7964 | 6.5515 | 43.248 | 0.47529 | 5.5841 | 5.8392 | 6.3145 |
| 35 | 125 | 1.8728 | 6.5566 | 43.884 | 0.4819 | 5.5925 | 5.8392 | 6.3211 |
| 36 | 130 | 1.9458 | 6.5615 | 44.784 | 0.49142 | 5.5997 | 5.8392 | 6.3306 |
| 37 | 135 | 2.0239 | 6.5667 | 45.366 | 0.49741 | 5.6069 | 5.8392 | 6.3366 |
| 38 | 140 | 2.0969 | 6.5716 | 46.107 | 0.50516 | 5.613 | 5.8392 | 6.3444 |
| 39 | 145 | 2.1733 | 6.5767 | 46.477 | 0.50882 | 5.613 | 5.8392 | 6.348 |
| 40 | 150 | 2.2497 | 6.5819 | 46.636 | 0.51016 | 5.6186 | 5.8392 | 6.3494 |
| 41 | 155 | 2.3244 | 6.5869 | 46.689 | 0.51035 | 5.6247 | 5.8392 | 6.3495 |
| 42 | 160 | 2.3991 | 6.5919 | 46.689 | 0.50996 | 5.6302 | 5.8392 | 6.3492 |
| 43 | 165 | 2.4738 | 6.597 | 46.954 | 0.51246 | 5.6352 | 5.8392 | 6.3517 |
| 44 | 170 | 2.5502 | 6.6022 | 47.483 | 0.51783 | 5.6397 | 5.8392 | 6.357 |
| 45 | 175 | 2.6266 | 6.6073 | 47.219 | 0.51454 | 5.6441 | 5.8392 | 6.3537 |
| 46 | 180 | 2.7029 | 6.6125 | 47.536 | 0.51759 | 5.6413 | 5.8392 | 6.3568 |
| 47 | 185 | 2.7776 | 6.6176 | 47.219 | 0.51374 | 5.6458 | 5.8392 | 6.3529 |
| 48 | 190 | 2.8557 | 6.6229 | 47.589 | 0.51736 | 5.6502 | 5.8392 | 6.3566 |
| 49 | 195 | 2.9304 | 6.628 | 47.324 | 0.51408 | 5.6541 | 5.8392 | 6.3533 |
| 50 | 200 | 3.0068 | 6.6332 | 47.483 | 0.5154 | 5.6574 | 5.8392 | 6.3546 |
| 51 | 205 | 3.0831 | 6.6385 | 47.589 | 0.51615 | 5.6608 | 5.8392 | 6.3553 |
| 52 | 210 | 3.1595 | 6.6437 | 47.748 | 0.51746 | 5.6641 | 5.8392 | 6.3567 |
| 53 | 215 | 3.2359 | 6.6489 | 48.277 | 0.52278 | 5.6613 | 5.8392 | 6.362 |
| 54 | 220 | 3.3106 | 6.6541 | 48.33 | 0.52295 | 5.6635 | 5.8392 | 6.3622 |
| 55 | 225 | 3.387 | 6.6593 | 48.754 | 0.52712 | 5.6674 | 5.8392 | 6.3663 |
| 56 | 230 | 3.4617 | 6.6645 | 48.86 | 0.52785 | 5.6702 | 5.8392 | 6.3671 |
| 57 | 235 | 3.5397 | 6.6699 | 48.754 | 0.52629 | 5.6735 | 5.8392 | 6.3655 |
| 58 | 240 | 3.6161 | 6.6752 | 48.912 | 0.52758 | 5.6758 | 5.8392 | 6.3668 |
| 59 | 245 | 3.6908 | 6.6804 | 49.177 | 0.53003 | 5.678 | 5.8392 | 6.3692 |
| 60 | 250 | 3.7655 | 6.6855 | 49.124 | 0.52904 | 5.6752 | 5.8392 | 6.3682 |
| 61 | 255 | 3.8402 | 6.6907 | 48.912 | 0.52635 | 5.6758 | 5.8392 | 6.3656 |
| 62 | 260 | 3.9166 | 6.6961 | 48.595 | 0.52252 | 5.678 | 5.8392 | 6.3617 |
| 63 | 265 | 3.9913 | 6.7013 | 48.648 | 0.52268 | 5.6802 | 5.8392 | 6.3619 |
| 64 | 270 | 4.0677 | 6.7066 | 48.86 | 0.52454 | 5.6824 | 5.8392 | 6.3637 |
| 65 | 275 | 4.1424 | 6.7118 | 48.277 | 0.51789 | 5.6841 | 5.8392 | 6.3571 |
| 66 | 280 | 4.2188 | 6.7172 | 48.33 | 0.51804 | 5.6858 | 5.8392 | 6.3572 |
| 67 | 285 | 4.2951 | 6.7225 | 48.595 | 0.52046 | 5.683 | 5.8392 | 6.3597 |
| 68 | 290 | 4.3715 | 6.7279 | 48.912 | 0.52345 | 5.6824 | 5.8392 | 6.3626 |
| 69 | 295 | 4.4479 | 6.7333 | 48.489 | 0.5185 | 5.6846 | 5.8392 | 6.3577 |
| 70 | 300 | 4.5259 | 6.7388 | 48.224 | 0.51525 | 5.6869 | 5.8392 | 6.3544 |
| [illegible] | 305 | 4.6023 | 6.7442 | 48.224 | 0.51484 | 5.6885 | 5.8392 | 6.354 |
| [illegible] | 310 | 4.6787 | 6.7496 | 48.171 | 0.51386 | 5.6896 | 5.8392 | 6.3531 |
| 73 | 315 | 4.755 | 6.755 | 48.224 | 0.51401 | 5.6902 | 5.8392 | 6.3532 |
| 74 | 320 | 4.8331 | 6.7605 | 48.224 | 0.51359 | 5.6869 | 5.8392 | 6.3528 |
| 75 | 325 | 4.9078 | 6.7658 | 48.33 | 0.51431 | 5.6863 | 5.8392 | 6.3535 |
| 76 | 330 | 4.9858 | 6.7714 | 48.171 | 0.5122 | 5.688 | 5.8392 | 6.3514 |
| 77 | 331.7 | 5.0107 | 6.7732 | 48.224 | 0.51263 | 5.6885 | 5.8392 | 6.3518 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-2 STAGE2
Sample No.: STAGE 2
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/28/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.47 in
Specimen Area: 6.43 in^2
Specimen Volume: 35.18 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.8392 | 5.8392 | 0 | 0.000 | 0.77317 | 0.77317 | 1.000 | 0.77317 | 0 |
| 2 | 0.03 | 5.8499 | 5.8392 | 0.068858 | 6.459 | 0.71497 | 0.70431 | 1.015 | 0.70964 | 0.00533 |
| 3 | 0.06 | 5.854 | 5.8392 | 0.092736 | 6.265 | 0.69523 | 0.68043 | 1.022 | 0.68783 | 0.0074005 |
| 4 | 0.09 | 5.8564 | 5.8392 | 0.1044 | 6.082 | 0.68593 | 0.66877 | 1.026 | 0.67735 | 0.0085821 |
| 5 | 0.12 | 5.8806 | 5.8392 | 0.12439 | 3.003 | 0.6902 | 0.64878 | 1.064 | 0.66949 | 0.020709 |
| 6 | 0.15 | 5.9037 | 5.8392 | 0.14327 | 2.222 | 0.69437 | 0.6299 | 1.102 | 0.66213 | 0.032237 |
| 7 | 0.18 | 5.9214 | 5.8392 | 0.16048 | 1.952 | 0.69488 | 0.61268 | 1.134 | 0.65378 | 0.041097 |
| 8 | 0.21 | 5.9415 | 5.8392 | 0.17603 | 1.721 | 0.6994 | 0.59713 | 1.171 | 0.64827 | 0.051134 |
| 9 | 0.24 | 5.9568 | 5.8392 | 0.18991 | 1.615 | 0.70085 | 0.58325 | 1.202 | 0.64205 | 0.058802 |
| 10 | 0.27 | 5.9739 | 5.8392 | 0.20324 | 1.509 | 0.70463 | 0.56992 | 1.236 | 0.63727 | 0.067351 |
| 11 | 0.30 | 5.9892 | 5.8392 | 0.21546 | 1.436 | 0.70772 | 0.55771 | 1.269 | 0.63272 | 0.075008 |
| 12 | 0.33 | 5.9986 | 5.8392 | 0.22712 | 1.425 | 0.70546 | 0.54605 | 1.292 | 0.62575 | 0.079708 |
| 13 | 0.36 | 6.0133 | 5.8392 | 0.23823 | 1.368 | 0.70906 | 0.53494 | 1.326 | 0.622 | 0.087062 |
| 14 | 0.39 | 6.0263 | 5.8392 | 0.24933 | 1.333 | 0.71089 | 0.52383 | 1.357 | 0.61736 | 0.093527 |
| 15 | 0.42 | 6.0386 | 5.8392 | 0.25988 | 1.303 | 0.71267 | 0.51328 | 1.388 | 0.61298 | 0.099693 |
| 16 | 0.45 | 6.0521 | 5.8392 | 0.26988 | 1.268 | 0.71618 | 0.50329 | 1.423 | 0.60973 | 0.10644 |
| 17 | 0.53 | 6.0796 | 5.8392 | 0.29431 | 1.224 | 0.71928 | 0.47885 | 1.502 | 0.59907 | 0.12021 |
| 18 | 0.60 | 6.1048 | 5.8392 | 0.31319 | 1.179 | 0.72553 | 0.45997 | 1.577 | 0.59275 | 0.13278 |
| 19 | 0.68 | 6.131 | 5.8392 | 0.33041 | 1.132 | 0.7346 | 0.44276 | 1.659 | 0.58868 | 0.14592 |
| 20 | 0.75 | 6.1526 | 5.8392 | 0.35095 | 1.120 | 0.73559 | 0.42221 | 1.742 | 0.5789 | 0.15669 |
| 21 | 0.83 | 6.1694 | 5.8392 | 0.36928 | 1.118 | 0.73406 | 0.40389 | 1.817 | 0.56898 | 0.16509 |
| 22 | 0.90 | 6.1908 | 5.8392 | 0.38649 | 1.099 | 0.73832 | 0.38667 | 1.909 | 0.5625 | 0.17582 |
| 23 | 0.98 | 6.2058 | 5.8392 | 0.4026 | 1.098 | 0.7372 | 0.37057 | 1.989 | 0.55389 | 0.18332 |
| 24 | 1.05 | 6.2202 | 5.8392 | 0.41759 | 1.096 | 0.73659 | 0.35558 | 2.072 | 0.54608 | 0.19051 |
| 25 | 1.12 | 6.2387 | 5.8392 | 0.42758 | 1.070 | 0.74506 | 0.34558 | 2.156 | 0.54532 | 0.19974 |
| 26 | 1.20 | 6.2548 | 5.8392 | 0.43869 | 1.056 | 0.75004 | 0.33448 | 2.242 | 0.54226 | 0.20778 |
| 27 | 1.27 | 6.2691 | 5.8392 | 0.45257 | 1.053 | 0.75047 | 0.32059 | 2.341 | 0.53553 | 0.21494 |
| 28 | 1.35 | 6.2793 | 5.8392 | 0.46479 | 1.056 | 0.74844 | 0.30838 | 2.427 | 0.52841 | 0.22003 |
| | 1.42 | 6.2889 | 5.8392 | 0.47645 | 1.060 | 0.74638 | 0.29671 | 2.515 | 0.52155 | 0.22483 |
| | 1.50 | 6.2961 | 5.8392 | 0.487 | 1.066 | 0.74307 | 0.28616 | 2.597 | 0.51462 | 0.22845 |
| 31 | 1.57 | 6.3016 | 5.8392 | 0.497 | 1.075 | 0.73855 | 0.27617 | 2.674 | 0.50736 | 0.23119 |
| 32 | 1.65 | 6.3041 | 5.8392 | 0.50088 | 1.077 | 0.73723 | 0.27228 | 2.708 | 0.50475 | 0.23247 |
| 33 | 1.72 | 6.312 | 5.8392 | 0.50866 | 1.076 | 0.73726 | 0.26451 | 2.787 | 0.50088 | 0.23638 |
| 34 | 1.80 | 6.3145 | 5.8392 | 0.5181 | 1.090 | 0.73036 | 0.25507 | 2.863 | 0.49271 | 0.23765 |
| 35 | 1.87 | 6.3211 | 5.8392 | 0.52643 | 1.092 | 0.72864 | 0.24674 | 2.953 | 0.48769 | 0.24095 |
| 36 | 1.95 | 6.3306 | 5.8392 | 0.53365 | 1.086 | 0.73093 | 0.23952 | 3.052 | 0.48523 | 0.24571 |
| 37 | 2.02 | 6.3366 | 5.8392 | 0.54087 | 1.087 | 0.72971 | 0.2323 | 3.141 | 0.481 | 0.2487 |
| 38 | 2.10 | 6.3444 | 5.8392 | 0.54697 | 1.083 | 0.73135 | 0.22619 | 3.233 | 0.47877 | 0.25258 |
| 39 | 2.17 | 6.348 | 5.8392 | 0.54697 | 1.075 | 0.73501 | 0.22619 | 3.250 | 0.4806 | 0.25441 |
| 40 | 2.25 | 6.3494 | 5.8392 | 0.55253 | 1.083 | 0.7308 | 0.22064 | 3.312 | 0.47572 | 0.25508 |
| 41 | 2.32 | 6.3495 | 5.8392 | 0.55864 | 1.095 | 0.72488 | 0.21453 | 3.379 | 0.4697 | 0.25517 |
| 42 | 2.40 | 6.3492 | 5.8392 | 0.56419 | 1.106 | 0.71894 | 0.20898 | 3.440 | 0.46396 | 0.25498 |
| 43 | 2.47 | 6.3517 | 5.8392 | 0.56919 | 1.111 | 0.71644 | 0.20398 | 3.512 | 0.46021 | 0.25623 |
| 44 | 2.55 | 6.357 | 5.8392 | 0.57363 | 1.108 | 0.71737 | 0.19954 | 3.595 | 0.45845 | 0.25891 |
| 45 | 2.63 | 6.3537 | 5.8392 | 0.57807 | 1.123 | 0.70963 | 0.19509 | 3.637 | 0.45236 | 0.25727 |
| 46 | 2.70 | 6.3568 | 5.8392 | 0.57529 | 1.111 | 0.71546 | 0.19787 | 3.616 | 0.45667 | 0.2588 |
| 47 | 2.78 | 6.3529 | 5.8392 | 0.57974 | 1.128 | 0.70717 | 0.19343 | 3.656 | 0.4503 | 0.25687 |
| 48 | 2.86 | 6.3566 | 5.8392 | 0.58418 | 1.129 | 0.70634 | 0.18899 | 3.738 | 0.44766 | 0.25868 |
| 49 | 2.93 | 6.3533 | 5.8392 | 0.58807 | 1.144 | 0.69918 | 0.1851 | 3.777 | 0.44214 | 0.25704 |
| 50 | 3.01 | 6.3546 | 5.8392 | 0.5914 | 1.147 | 0.69717 | 0.18177 | 3.836 | 0.43947 | 0.2577 |
| 51 | 3.08 | 6.3553 | 5.8392 | 0.59473 | 1.152 | 0.69458 | 0.17844 | 3.893 | 0.43651 | 0.25807 |
| 52 | 3.16 | 6.3567 | 5.8392 | 0.59806 | 1.156 | 0.69256 | 0.1751 | 3.955 | 0.43383 | 0.25873 |
| 53 | 3.24 | 6.362 | 5.8392 | 0.59529 | 1.139 | 0.70066 | 0.17788 | 3.939 | 0.43927 | 0.26139 |
| 54 | 3.31 | 6.3622 | 5.8392 | 0.59751 | 1.143 | 0.69861 | 0.17566 | 3.977 | 0.43714 | 0.26148 |
| 55 | 3.39 | 6.3663 | 5.8392 | 0.60139 | 1.141 | 0.69889 | 0.17177 | 4.069 | 0.43533 | 0.26356 |
| 56 | 3.46 | 6.3671 | 5.8392 | 0.60417 | 1.145 | 0.69685 | 0.16899 | 4.123 | 0.43292 | 0.26393 |
| 57 | 3.54 | 6.3655 | 5.8392 | 0.6075 | 1.154 | 0.69195 | 0.16566 | 4.177 | 0.42881 | 0.26314 |
| 58 | 3.62 | 6.3668 | 5.8392 | 0.60972 | 1.156 | 0.69102 | 0.16344 | 4.228 | 0.42723 | 0.26379 |
| 59 | 3.69 | 6.3692 | 5.8392 | 0.61194 | 1.155 | 0.69125 | 0.16122 | 4.288 | 0.42623 | 0.26501 |
| 60 | 3.77 | 6.3682 | 5.8392 | 0.60917 | 1.151 | 0.69304 | 0.164 | 4.226 | 0.42852 | 0.26452 |
| 61 | 3.84 | 6.3656 | 5.8392 | 0.60972 | 1.158 | 0.6898 | 0.16344 | 4.220 | 0.42662 | 0.26318 |
| 62 | 3.92 | 6.3617 | 5.8392 | 0.61194 | 1.171 | 0.68374 | 0.16122 | 4.241 | 0.42248 | 0.26126 |
| 63 | 3.99 | 6.3619 | 5.8392 | 0.61417 | 1.175 | 0.68168 | 0.159 | 4.287 | 0.42034 | 0.26134 |
| 64 | 4.07 | 6.3637 | 5.8392 | 0.61639 | 1.175 | 0.68132 | 0.15678 | 4.346 | 0.41905 | 0.26227 |
| 65 | 4.14 | 6.3571 | 5.8392 | 0.61805 | 1.193 | 0.673 | 0.15511 | 4.339 | 0.41406 | 0.25894 |
| 66 | 4.22 | 6.3572 | 5.8392 | 0.61972 | 1.196 | 0.67149 | 0.15345 | 4.376 | 0.41247 | 0.25902 |
| 67 | 4.30 | 6.3597 | 5.8392 | 0.61694 | 1.185 | 0.67669 | 0.15622 | 4.332 | 0.41645 | 0.26023 |
| 68 | 4.37 | 6.3626 | 5.8392 | 0.61639 | 1.178 | 0.68022 | 0.15678 | 4.339 | 0.4185 | 0.26172 |
| 69 | 4.45 | 6.3577 | 5.8392 | 0.61861 | 1.193 | 0.67306 | 0.15456 | 4.355 | 0.41381 | 0.25925 |
| | 4.53 | 6.3544 | 5.8392 | 0.62083 | 1.205 | 0.66758 | 0.15234 | 4.382 | 0.40996 | 0.25762 |
| | 4.60 | 6.354 | 5.8392 | 0.6225 | 1.209 | 0.66551 | 0.15067 | 4.417 | 0.40809 | 0.25742 |
| 72 | 4.68 | 6.3531 | 5.8392 | 0.62361 | 1.214 | 0.66342 | 0.14956 | 4.436 | 0.40649 | 0.25693 |
| 73 | 4.76 | 6.3532 | 5.8392 | 0.62416 | 1.214 | 0.66302 | 0.149 | 4.450 | 0.40601 | 0.25701 |
| 74 | 4.83 | 6.3528 | 5.8392 | 0.62083 | 1.209 | 0.66593 | 0.15234 | 4.371 | 0.40913 | 0.2568 |
| 75 | 4.91 | 6.3535 | 5.8392 | 0.62027 | 1.206 | 0.66721 | 0.15289 | 4.364 | 0.41005 | 0.25716 |
| 76 | 4.99 | 6.3514 | 5.8392 | 0.62194 | 1.214 | 0.66343 | 0.15123 | 4.387 | 0.40733 | 0.2561 |
| 77 | 5.01 | 6.3518 | 5.8392 | 0.6225 | 1.214 | 0.6633 | 0.15067 | 4.402 | 0.40699 | 0.25632 |

# TRIAXIAL TEST

Project: RICO ARGENTINE
Boring No.: ST-2 STAGE3
Sample No.: S-6
Test No.: 12 PSI

Location: INDOT LAPOINTE DISTRICT
Tested By: BCM
Test Date: 4/18/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 25.0'-27.3'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 4.60 in
Specimen Area: 6.47 in^2
Specimen Volume: 29.79 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.4732 | 0 | 0 | 5.0438 | 7.0416 | 7.0416 |
| 2 | 5.0041 | 0.080863 | 6.4784 | 16.039 | 0.17826 | 5.2137 | 7.0416 | 7.2199 |
| 3 | 10 | 0.16764 | 6.484 | 27.156 | 0.30155 | 5.3381 | 7.0416 | 7.3431 |
| 4 | 15 | 0.25442 | 6.4897 | 35.626 | 0.39525 | 5.4459 | 7.0416 | 7.4369 |
| 5 | 20 | 0.3412 | 6.4953 | 42.56 | 0.47178 | 5.5403 | 7.0416 | 7.5134 |
| 6 | 25 | 0.42996 | 6.5011 | 48.171 | 0.5335 | 5.6202 | 7.0416 | 7.5751 |
| 7 | 30 | 0.51871 | 6.5069 | 53.412 | 0.59101 | 5.6969 | 7.0416 | 7.6326 |
| 8 | 35.001 | 0.60549 | 6.5126 | 57.541 | 0.63615 | 5.7652 | 7.0416 | 7.6777 |
| 9 | 40.001 | 0.69424 | 6.5184 | 61.246 | 0.67651 | 5.8285 | 7.0416 | 7.7181 |
| 10 | 45.001 | 0.78299 | 6.5242 | 64.687 | 0.71387 | 5.8857 | 7.0416 | 7.7555 |
| 11 | 50.001 | 0.87175 | 6.5301 | 67.493 | 0.74417 | 5.9368 | 7.0416 | 7.7858 |
| 12 | 55.001 | 0.96247 | 6.5361 | 70.246 | 0.77381 | 5.984 | 7.0416 | 7.8154 |
| 13 | 60.001 | 1.0512 | 6.5419 | 72.575 | 0.79875 | 6.025 | 7.0416 | 7.8404 |
| 14 | 70.001 | 1.2327 | 6.5539 | 76.862 | 0.84439 | 6.0995 | 7.0416 | 7.886 |
| 15 | 80.001 | 1.4102 | 6.5657 | 80.039 | 0.8777 | 6.1639 | 7.0416 | 7.9193 |
| 16 | 90.002 | 1.5916 | 6.5778 | 82.95 | 0.90796 | 6.2216 | 7.0416 | 7.9496 |
| 17 | 100 | 1.7691 | 6.5897 | 85.438 | 0.9335 | 6.2649 | 7.0416 | 7.9751 |
| 18 | 110 | 1.9486 | 6.6018 | 87.503 | 0.95431 | 6.3088 | 7.0416 | 7.9959 |
| 19 | 120 | 2.1281 | 6.6139 | 89.567 | 0.97504 | 6.346 | 7.0416 | 8.0166 |
| 20 | 130 | 2.3095 | 6.6262 | 91.155 | 0.99049 | 6.3777 | 7.0416 | 8.0321 |
| 21 | 140 | 2.489 | 6.6384 | 92.108 | 0.999 | 6.4038 | 7.0416 | 8.0406 |
| 22 | 150 | 2.6685 | 6.6506 | 93.008 | 1.0069 | 6.431 | 7.0416 | 8.0485 |
| 23 | 160 | 2.8499 | 6.663 | 94.067 | 1.0165 | 6.4548 | 7.0416 | 8.0581 |
| 24 | 170 | 3.0274 | 6.6752 | 94.755 | 1.022 | 6.4704 | 7.0416 | 8.0636 |
| 25 | 180 | 3.2069 | 6.6876 | 95.443 | 1.0276 | 6.4904 | 7.0416 | 8.0692 |
| 26 | 190 | 3.3923 | 6.7005 | 96.078 | 1.0324 | 6.5109 | 7.0416 | 8.074 |
| 27 | 200 | 3.5718 | 6.7129 | 96.713 | 1.0373 | 6.5198 | 7.0416 | 8.0789 |
| 28 | 210 | 3.7513 | 6.7254 | 97.243 | 1.041 | 6.537 | 7.0416 | 8.0826 |
| 29 | 220 | 3.9307 | 6.738 | 97.772 | 1.0448 | 6.5515 | 7.0416 | 8.0864 |
| [illegible] | 230 | 4.1102 | 6.7506 | 98.09 | 1.0462 | 6.5642 | 7.0416 | 8.0878 |
| [illegible] | 240 | 4.2897 | 6.7633 | 98.143 | 1.0448 | 6.5698 | 7.0416 | 8.0864 |
| 32 | 270 | 4.836 | 6.8021 | 99.043 | 1.0484 | 6.5942 | 7.0416 | 8.09 |
| 33 | 300 | 5.3745 | 6.8408 | 99.466 | 1.0469 | 6.6192 | 7.0416 | 8.0885 |
| 34 | 330 | 5.9129 | 6.88 | 99.095 | 1.0371 | 6.6331 | 7.0416 | 8.0787 |
| 35 | 360 | 6.4493 | 6.9194 | 96.184 | 1.0008 | 6.6353 | 7.0416 | 8.0424 |
| 36 | 390 | 6.9917 | 6.9598 | 93.643 | 0.96876 | 6.6442 | 7.0416 | 8.0104 |
| 37 | 420 | 7.5301 | 7.0003 | 90.467 | 0.93048 | 6.6542 | 7.0416 | 7.9721 |
| 38 | 450 | 8.0725 | 7.0416 | 88.297 | 0.90283 | 6.6625 | 7.0416 | 7.9444 |
| 39 | 480 | 8.6129 | 7.0832 | 88.138 | 0.89591 | 6.6698 | 7.0416 | 7.9375 |
| 40 | 510 | 9.1474 | 7.1249 | 87.714 | 0.88639 | 6.6753 | 7.0416 | 7.928 |
| 41 | 540 | 9.6878 | 7.1675 | 87.079 | 0.87474 | 6.6797 | 7.0416 | 7.9163 |
| 42 | 570 | 10.228 | 7.2107 | 86.973 | 0.86844 | 6.6831 | 7.0416 | 7.91 |
| 43 | 600 | 10.769 | 7.2543 | 86.338 | 0.85691 | 6.6847 | 7.0416 | 7.8985 |
| 44 | 630 | 11.303 | 7.2981 | 86.285 | 0.85126 | 6.6875 | 7.0416 | 7.8929 |
| 45 | 660 | 11.84 | 7.3425 | 86.603 | 0.84922 | 6.6903 | 7.0416 | 7.8908 |
| 46 | 690 | 12.378 | 7.3876 | 87.079 | 0.84868 | 6.6931 | 7.0416 | 7.8903 |
| 47 | 720 | 12.916 | 7.4333 | 86.973 | 0.84244 | 6.6936 | 7.0416 | 7.884 |
| 48 | 750 | 13.461 | 7.48 | 86.92 | 0.83666 | 6.6959 | 7.0416 | 7.8783 |
| 49 | 780 | 14.003 | 7.5272 | 86.073 | 0.82332 | 6.6975 | 7.0416 | 7.8649 |
| 50 | 810 | 14.546 | 7.575 | 86.338 | 0.82064 | 6.6992 | 7.0416 | 7.8622 |
| 51 | 840 | 15.084 | 7.623 | 86.814 | 0.81997 | 6.7008 | 7.0416 | 7.8616 |

# TRIAXIAL TEST

Project: RICO ARGENTINE
Boring No.: ST-2 STAGE3
Sample No.: S-6
Test No.: 12 PSI

Location: INDOT LAPOINTE DISTRICT
Tested By: BCM
Test Date: 4/18/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 25.0'-27.3'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Sp[illegible]men Height: 4.60 in
Specimen Area: 6.47 in^2
Specimen Volume: 29.79 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

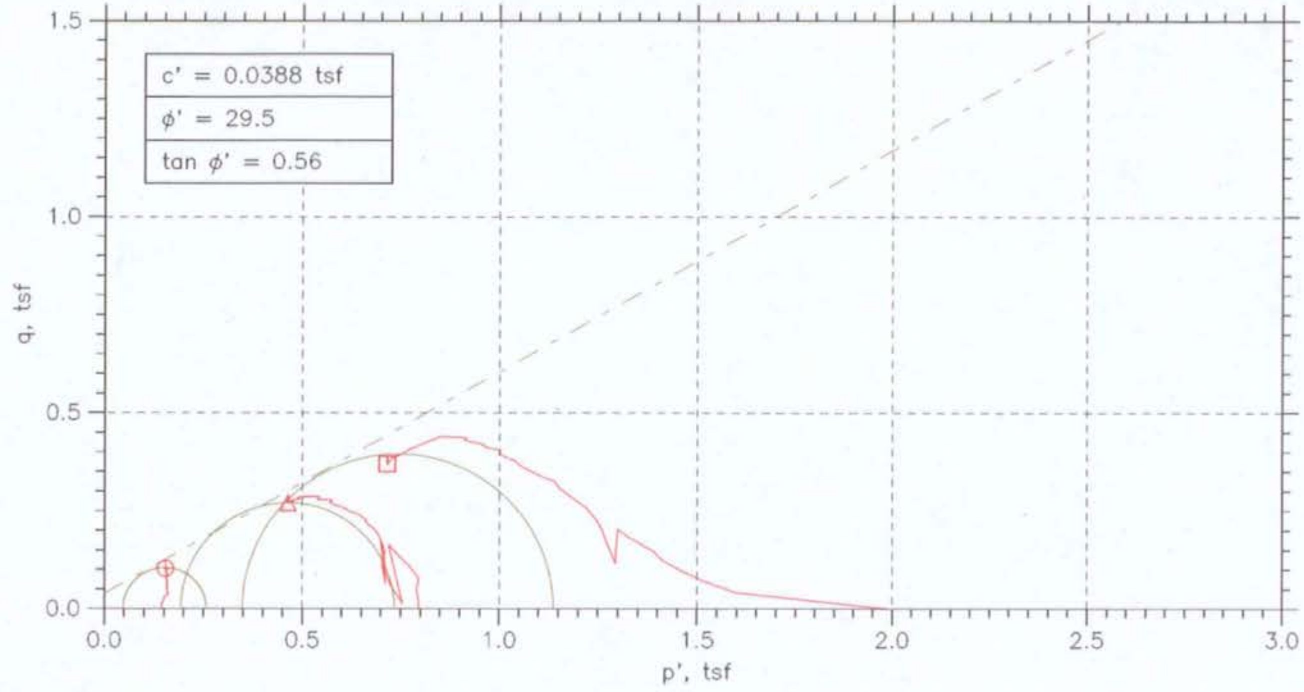
Liquid Limit: 73

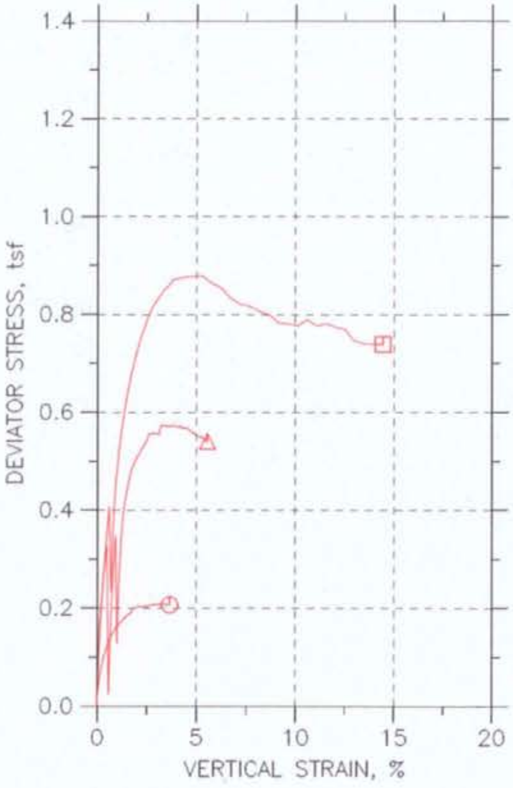
Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 7.0416 | 7.0416 | 0 | 0.000 | 1.9978 | 1.9978 | 1.000 | 1.9978 | 0 |
| 2 | 0.08 | 7.2199 | 7.0416 | 0.16992 | 0.953 | 2.0061 | 1.8279 | 1.098 | 1.917 | 0.08913 |
| 3 | 0.17 | 7.3431 | 7.0416 | 0.29431 | 0.976 | 2.005 | 1.7035 | 1.177 | 1.8542 | 0.15077 |
| 4 | 0.25 | 7.4369 | 7.0416 | 0.40204 | 1.017 | 1.991 | 1.5957 | 1.248 | 1.7934 | 0.19763 |
| 5 | 0.34 | 7.5134 | 7.0416 | 0.49644 | 1.052 | 1.9731 | 1.5013 | 1.314 | 1.7372 | 0.23589 |
| 6 | 0.43 | 7.5751 | 7.0416 | 0.57641 | 1.080 | 1.9549 | 1.4214 | 1.375 | 1.6881 | 0.26675 |
| 7 | 0.52 | 7.6326 | 7.0416 | 0.65304 | 1.105 | 1.9358 | 1.3447 | 1.439 | 1.6402 | 0.29551 |
| 8 | 0.61 | 7.6777 | 7.0416 | 0.72134 | 1.134 | 1.9126 | 1.2764 | 1.498 | 1.5945 | 0.31807 |
| 9 | 0.69 | 7.7181 | 7.0416 | 0.78464 | 1.160 | 1.8896 | 1.2131 | 1.558 | 1.5514 | 0.33825 |
| 10 | 0.78 | 7.7555 | 7.0416 | 0.84184 | 1.179 | 1.8698 | 1.1559 | 1.618 | 1.5129 | 0.35694 |
| 11 | 0.87 | 7.7858 | 7.0416 | 0.89293 | 1.200 | 1.849 | 1.1048 | 1.674 | 1.4769 | 0.37209 |
| 12 | 0.96 | 7.8154 | 7.0416 | 0.94013 | 1.215 | 1.8315 | 1.0576 | 1.732 | 1.4446 | 0.38691 |
| 13 | 1.05 | 7.8404 | 7.0416 | 0.98122 | 1.228 | 1.8153 | 1.0166 | 1.786 | 1.4159 | 0.39938 |
| 14 | 1.23 | 7.886 | 7.0416 | 1.0556 | 1.250 | 1.7865 | 0.94215 | 1.896 | 1.3643 | 0.4222 |
| 15 | 1.41 | 7.9193 | 7.0416 | 1.12 | 1.276 | 1.7554 | 0.87773 | 2.000 | 1.3166 | 0.43885 |
| 16 | 1.59 | 7.9496 | 7.0416 | 1.1778 | 1.297 | 1.7279 | 0.81998 | 2.107 | 1.274 | 0.45398 |
| 17 | 1.77 | 7.9751 | 7.0416 | 1.2211 | 1.308 | 1.7102 | 0.77666 | 2.202 | 1.2434 | 0.46675 |
| 18 | 1.95 | 7.9959 | 7.0416 | 1.265 | 1.326 | 1.6871 | 0.7328 | 2.302 | 1.21 | 0.47716 |
| 19 | 2.13 | 8.0166 | 7.0416 | 1.3022 | 1.336 | 1.6706 | 0.69559 | 2.402 | 1.1831 | 0.48752 |
| 20 | 2.31 | 8.0321 | 7.0416 | 1.3338 | 1.347 | 1.6544 | 0.66394 | 2.492 | 1.1592 | 0.49524 |
| 21 | 2.49 | 8.0406 | 7.0416 | 1.3599 | 1.361 | 1.6368 | 0.63784 | 2.566 | 1.1373 | 0.4995 |
| 22 | 2.67 | 8.0485 | 7.0416 | 1.3871 | 1.378 | 1.6175 | 0.61063 | 2.649 | 1.1141 | 0.50345 |
| 23 | 2.85 | 8.0581 | 7.0416 | 1.411 | 1.388 | 1.6032 | 0.58675 | 2.732 | 1.095 | 0.50824 |
| 24 | 3.03 | 8.0636 | 7.0416 | 1.4266 | 1.396 | 1.5932 | 0.5712 | 2.789 | 1.0822 | 0.51102 |
| 25 | 3.21 | 8.0692 | 7.0416 | 1.4466 | 1.408 | 1.5788 | 0.55121 | 2.864 | 1.065 | 0.51378 |
| 26 | 3.39 | 8.074 | 7.0416 | 1.4671 | 1.421 | 1.5631 | 0.53067 | 2.946 | 1.0469 | 0.51621 |
| 27 | 3.57 | 8.0789 | 7.0416 | 1.476 | 1.423 | 1.5591 | 0.52178 | 2.988 | 1.0404 | 0.51865 |
| 28 | 3.75 | 8.0826 | 7.0416 | 1.4932 | 1.434 | 1.5456 | 0.50457 | 3.063 | 1.0251 | 0.52052 |
| [illegible] | 3.93 | 8.0864 | 7.0416 | 1.5076 | 1.443 | 1.5349 | 0.49013 | 3.132 | 1.0125 | 0.52238 |
| [illegible] | 4.11 | 8.0878 | 7.0416 | 1.5204 | 1.453 | 1.5236 | 0.47736 | 3.192 | 1.0005 | 0.5231 |
| 31 | 4.29 | 8.0864 | 7.0416 | 1.526 | 1.461 | 1.5166 | 0.4718 | 3.214 | 0.9942 | 0.5224 |
| 32 | 4.84 | 8.09 | 7.0416 | 1.5504 | 1.479 | 1.4957 | 0.44737 | 3.343 | 0.97155 | 0.52418 |
| 33 | 5.37 | 8.0885 | 7.0416 | 1.5754 | 1.505 | 1.4693 | 0.42238 | 3.479 | 0.94582 | 0.52344 |
| 34 | 5.91 | 8.0787 | 7.0416 | 1.5893 | 1.532 | 1.4456 | 0.4085 | 3.539 | 0.92702 | 0.51853 |
| 35 | 6.45 | 8.0424 | 7.0416 | 1.5915 | 1.590 | 1.4071 | 0.40628 | 3.463 | 0.9067 | 0.50042 |
| 36 | 6.99 | 8.0104 | 7.0416 | 1.6004 | 1.652 | 1.3661 | 0.39739 | 3.438 | 0.88177 | 0.48438 |
| 37 | 7.53 | 7.9721 | 7.0416 | 1.6104 | 1.731 | 1.3179 | 0.3874 | 3.402 | 0.85264 | 0.46524 |
| 38 | 8.07 | 7.9444 | 7.0416 | 1.6187 | 1.793 | 1.2819 | 0.37907 | 3.382 | 0.83048 | 0.45141 |
| 39 | 8.61 | 7.9375 | 7.0416 | 1.6259 | 1.815 | 1.2678 | 0.37185 | 3.409 | 0.8198 | 0.44795 |
| 40 | 9.15 | 7.928 | 7.0416 | 1.6315 | 1.841 | 1.2527 | 0.3663 | 3.420 | 0.80949 | 0.44319 |
| 41 | 9.69 | 7.9163 | 7.0416 | 1.6359 | 1.870 | 1.2366 | 0.36185 | 3.417 | 0.79922 | 0.43737 |
| 42 | 10.23 | 7.91 | 7.0416 | 1.6393 | 1.888 | 1.227 | 0.35852 | 3.422 | 0.79274 | 0.43422 |
| 43 | 10.77 | 7.8985 | 7.0416 | 1.6409 | 1.915 | 1.2138 | 0.35686 | 3.401 | 0.78531 | 0.42846 |
| 44 | 11.30 | 7.8929 | 7.0416 | 1.6437 | 1.931 | 1.2053 | 0.35408 | 3.404 | 0.77971 | 0.42563 |
| 45 | 11.84 | 7.8908 | 7.0416 | 1.6465 | 1.939 | 1.2005 | 0.3513 | 3.417 | 0.77591 | 0.42461 |
| 46 | 12.38 | 7.8903 | 7.0416 | 1.6493 | 1.943 | 1.1972 | 0.34853 | 3.435 | 0.77287 | 0.42434 |
| 47 | 12.92 | 7.884 | 7.0416 | 1.6498 | 1.958 | 1.1904 | 0.34797 | 3.421 | 0.76919 | 0.42122 |
| 48 | 13.46 | 7.8783 | 7.0416 | 1.652 | 1.975 | 1.1824 | 0.34575 | 3.420 | 0.76408 | 0.41833 |
| 49 | 14.00 | 7.8649 | 7.0416 | 1.6537 | 2.009 | 1.1674 | 0.34408 | 3.393 | 0.75574 | 0.41166 |
| 50 | 14.55 | 7.8622 | 7.0416 | 1.6554 | 2.017 | 1.1631 | 0.34242 | 3.397 | 0.75274 | 0.41032 |
| 51 | 15.08 | 7.8616 | 7.0416 | 1.657 | 2.021 | 1.1607 | 0.34075 | 3.406 | 0.75074 | 0.40999 |

# TRIAXIAL COMPRESSION TEST REPORT





| Symbol | | ○ | △ | □ | |
|---|---|---|---|---|---|
| Test No. | | 2 PSI | 11.1 PSI | 27.8 PSI | |
| Initial | Diameter, in | 2.8311 | 2.8846 | 2.9134 | |
| | Height, in | 5.9906 | 5.3016 | 4.8201 | |
| | Water Content, % | 213.55 | 210.02 | 190.13 | |
| | Dry Density, pcf | 25.13 | 25.55 | 27.8 | |
| | Saturation, % | 99.34 | 99.56 | 99.47 | |
| | Void Ratio | 6.4365 | 6.3159 | 5.723 | |
| Before Shear | Water Content, % | 210.02 | 190.13 | 165.00 | |
| | Dry Density, pcf | 25.65 | 27.93 | 31.47 | |
| | Saturation, % | 100.00 | 100.00 | 100.00 | |
| | Void Ratio | 6.288 | 5.6925 | 4.9401 | |
| | Back Press., tsf | 5.0404 | 5.0415 | 5.0437 | |
| Minor Prin. Stress, tsf | | 0.14361 | 0.79772 | 1.9979 | |
| Max. Dev. Stress, tsf | | 0.21 | 0.57402 | 0.87985 | |
| Time to Failure, min | | 235 | 225 | 330 | |
| Strain Rate, %/min | | 0.02 | 0.002 | 0.002 | |
| B-Value | | .98 | --- | --- | |
| Estimated Specific Gravity | | 2.99 | 2.99 | 2.99 | |
| Liquid Limit | | 74 | 74 | 74 | |
| Plastic Limit | | 57 | 57 | 57 | |
| Plasticity Index | | 17 | 17 | 17 | |
| Failure Sketch | |  |  |  | |

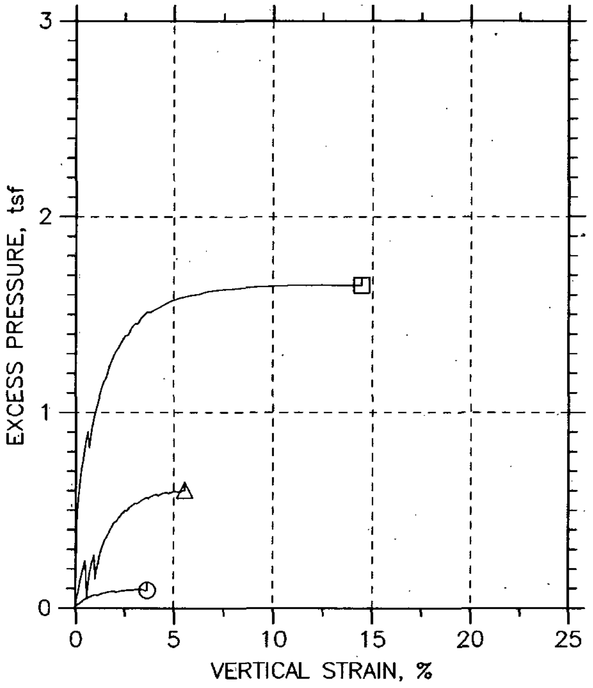
Project: RICO ARGENTINE SITE OU01
Location: RICO, CO
Project No.: 60157757
[illegible]ring No.: ST-3
Sample Type: 3" ST

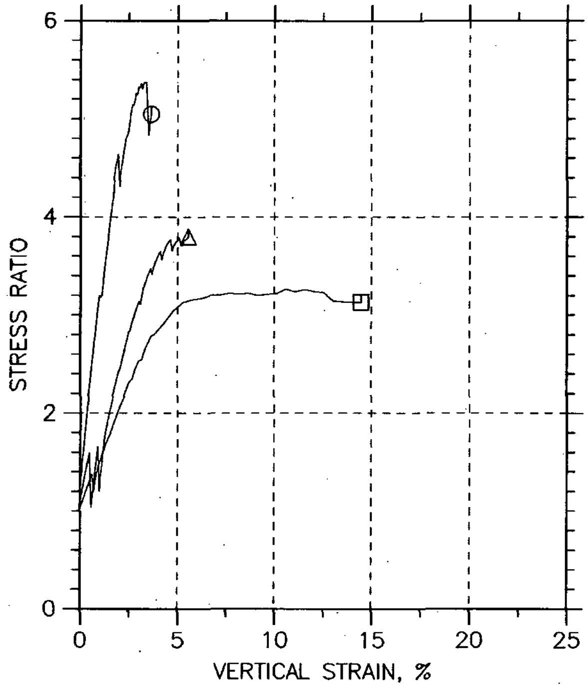
Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST

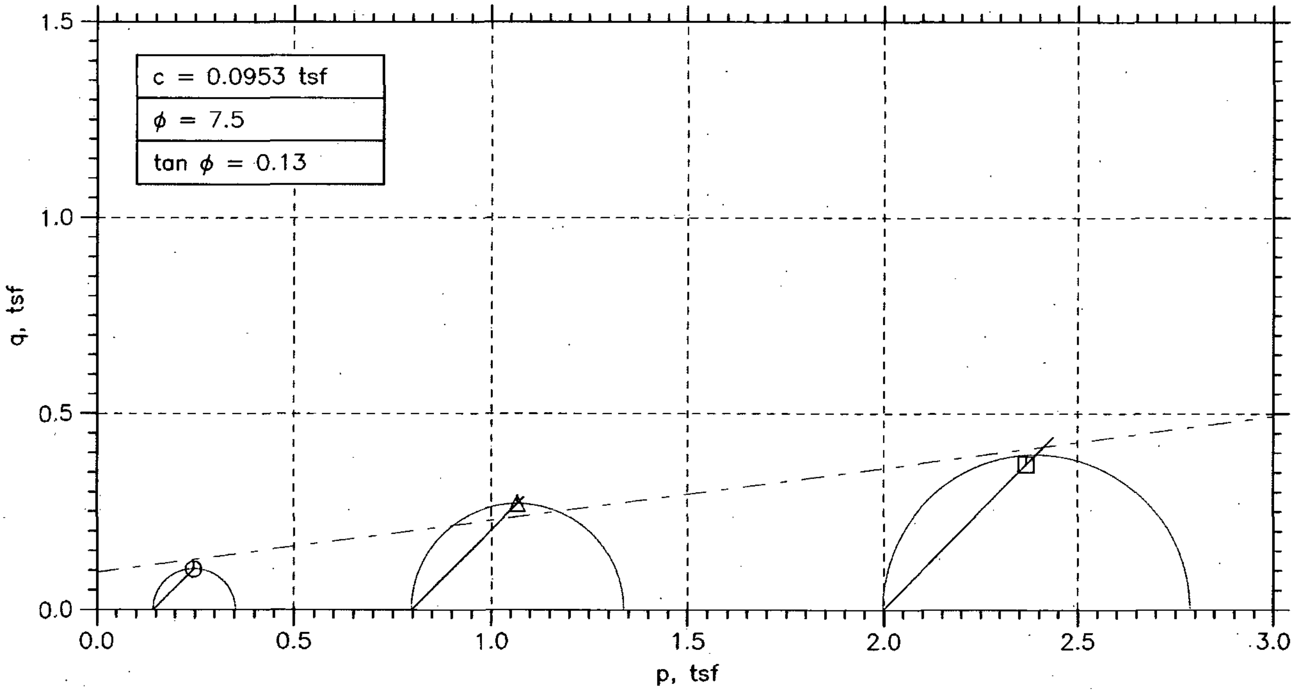
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Thu, 01-DEC-2011 13:40:31

# TRIAXIAL COMPRESSION TEST REPORT







| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-3 | Test Date: 11/22/11 | Depth: 2.0'-4.0' |
| st No.: ST-3 | Sample Type: 3" ST | Elevation: ---- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST | | |
| Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767. | | |
| | | |

Thu, 01-DEC-2011 13:41:19

# TRIAXIAL TEST

**AECOM**

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-3 | Test Date: 11/22/11 | Depth: 2.0'-4.0' |
| Test No.: 2 PSI | Sample Type: 3" ST | Elevation: ---- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

| | | |
|---|---|---|
| Specimen Height: 5.99 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.30 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 37.71 in^3 | Piston Weight: 0.00 lb | Correction Type: Uniform |
| Liquid Limit: 74 | Plastic Limit: 57 | Estimated Specific Gravity: 2.99 |

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.2951 | 0 | 0 | 5.0404 | 5.184 | 5.184 |
| 2 | 2.004 | 0.025692 | 6.2967 | 1.8882 | 0.02159 | 5.0485 | 5.184 | 5.2056 |
| 3 | 4.0041 | 0.051383 | 6.2983 | 2.8323 | 0.032377 | 5.0529 | 5.184 | 5.2164 |
| 4 | 6.0041 | 0.077075 | 6.2999 | 3.619 | 0.04136 | 5.0562 | 5.184 | 5.2254 |
| 5 | 8.0041 | 0.10419 | 6.3016 | 4.3533 | 0.049739 | 5.0589 | 5.184 | 5.2337 |
| 6 | 10.004 | 0.12846 | 6.3032 | 4.9827 | 0.056916 | 5.0616 | 5.184 | 5.2409 |
| 7 | 12 | 0.15558 | 6.3049 | 5.6121 | 0.064088 | 5.0621 | 5.184 | 5.2481 |
| 8 | 14 | 0.17984 | 6.3064 | 6.1365 | 0.070061 | 5.061 | 5.184 | 5.2541 |
| 9 | 16 | 0.20553 | 6.308 | 6.6086 | 0.07543 | 5.061 | 5.184 | 5.2594 |
| 10 | 18 | 0.23122 | 6.3097 | 7.0806 | 0.080797 | 5.0643 | 5.184 | 5.2648 |
| 11 | 20 | 0.25692 | 6.3113 | 7.4478 | 0.084965 | 5.0665 | 5.184 | 5.269 |
| 12 | 22 | 0.28404 | 6.313 | 7.8674 | 0.089727 | 5.0687 | 5.184 | 5.2737 |
| 13 | 24 | 0.30973 | 6.3146 | 8.287 | 0.094489 | 5.0719 | 5.184 | 5.2785 |
| 14 | 26 | 0.33685 | 6.3164 | 8.6541 | 0.098648 | 5.0741 | 5.184 | 5.2826 |
| 15 | 28 | 0.36111 | 6.3179 | 9.0737 | 0.10341 | 5.0763 | 5.184 | 5.2874 |
| 16 | 30 | 0.38823 | 6.3196 | 9.3884 | 0.10696 | 5.0784 | 5.184 | 5.291 |
| 17 | 35 | 0.45389 | 6.3238 | 10.175 | 0.11585 | 5.0828 | 5.184 | 5.2998 |
| 18 | 40.001 | 0.51669 | 6.3278 | 10.805 | 0.12294 | 5.0871 | 5.184 | 5.3069 |
| 19 | 45.001 | 0.58092 | 6.3319 | 11.486 | 0.13061 | 5.0904 | 5.184 | 5.3146 |
| 20 | 50.001 | 0.64515 | 6.336 | 12.063 | 0.13708 | 5.0937 | 5.184 | 5.3211 |
| 21 | 55.001 | 0.70652 | 6.3399 | 12.535 | 0.14236 | 5.0969 | 5.184 | 5.3264 |
| 22 | 60.001 | 0.77075 | 6.344 | 13.007 | 0.14763 | 5.0996 | 5.184 | 5.3316 |
| 23 | 65.001 | 0.83212 | 6.3479 | 13.375 | 0.1517 | 5.1023 | 5.184 | 5.3357 |
| 24 | 70.001 | 0.89778 | 6.3521 | 13.847 | 0.15695 | 5.1056 | 5.184 | 5.3409 |
| 25 | 75.001 | 0.96058 | 6.3561 | 14.214 | 0.16101 | 5.1078 | 5.184 | 5.345 |
| 26 | 80.001 | 1.0234 | 6.3602 | 14.476 | 0.16387 | 5.1094 | 5.184 | 5.3479 |
| 27 | 85.001 | 1.0862 | 6.3642 | 14.791 | 0.16733 | 5.1072 | 5.184 | 5.3513 |
| 28 | 90.001 | 1.1504 | 6.3683 | 15.053 | 0.17019 | 5.1067 | 5.184 | 5.3542 |
| 29 | 95.002 | 1.2132 | 6.3724 | 15.263 | 0.17245 | 5.11 | 5.184 | 5.3564 |
| [illegible] | 100 | 1.2789 | 6.3766 | 15.577 | 0.17589 | 5.1127 | 5.184 | 5.3599 |
| [illegible] | 105 | 1.3431 | 6.3808 | 15.84 | 0.17873 | 5.1148 | 5.184 | 5.3627 |
| 32 | 110 | 1.4102 | 6.3851 | 16.102 | 0.18157 | 5.1165 | 5.184 | 5.3656 |
| 33 | 115 | 1.4758 | 6.3894 | 16.364 | 0.1844 | 5.1186 | 5.184 | 5.3684 |
| 34 | 120 | 1.5372 | 6.3934 | 16.574 | 0.18665 | 5.1203 | 5.184 | 5.3707 |
| 35 | 125 | 1.6 | 6.3974 | 16.731 | 0.1883 | 5.1219 | 5.184 | 5.3723 |
| 36 | 130 | 1.6657 | 6.4017 | 16.889 | 0.18995 | 5.1235 | 5.184 | 5.3739 |
| 37 | 135 | 1.7299 | 6.4059 | 17.046 | 0.19159 | 5.1246 | 5.184 | 5.3756 |
| 38 | 140 | 1.7927 | 6.41 | 17.728 | 0.19913 | 5.1257 | 5.184 | 5.3831 |
| 39 | 145 | 1.8569 | 6.4142 | 17.938 | 0.20135 | 5.1268 | 5.184 | 5.3854 |
| 40 | 150 | 1.9197 | 6.4183 | 17.885 | 0.20063 | 5.1279 | 5.184 | 5.3846 |
| 41 | 155 | 1.984 | 6.4225 | 18.042 | 0.20227 | 5.1284 | 5.184 | 5.3863 |
| 42 | 160 | 2.0496 | 6.4268 | 18.2 | 0.20389 | 5.1225 | 5.184 | 5.3879 |
| 43 | 165 | 2.1153 | 6.4311 | 18.357 | 0.20552 | 5.1246 | 5.184 | 5.3895 |
| 44 | 170 | 2.1809 | 6.4354 | 18.305 | 0.20479 | 5.1263 | 5.184 | 5.3888 |
| 45 | 175 | 2.2452 | 6.4397 | 18.2 | 0.20349 | 5.1279 | 5.184 | 5.3875 |
| 46 | 180 | 2.3137 | 6.4442 | 18.305 | 0.20452 | 5.129 | 5.184 | 5.3885 |
| 47 | 185 | 2.3779 | 6.4484 | 18.357 | 0.20497 | 5.1301 | 5.184 | 5.389 |
| 48 | 190 | 2.4436 | 6.4528 | 18.305 | 0.20424 | 5.1306 | 5.184 | 5.3882 |
| 49 | 195 | 2.5092 | 6.4571 | 18.305 | 0.20411 | 5.1311 | 5.184 | 5.3881 |
| 50 | 200 | 2.5734 | 6.4614 | 18.357 | 0.20456 | 5.1322 | 5.184 | 5.3886 |
| 51 | 205 | 2.6391 | 6.4657 | 18.515 | 0.20617 | 5.1333 | 5.184 | 5.3902 |
| 52 | 210 | 2.7048 | 6.4701 | 18.672 | 0.20778 | 5.1339 | 5.184 | 5.3918 |
| 53 | 215 | 2.7704 | 6.4744 | 18.672 | 0.20764 | 5.1339 | 5.184 | 5.3916 |
| 54 | 220 | 2.8346 | 6.4787 | 18.672 | 0.20751 | 5.1344 | 5.184 | 5.3915 |
| 55 | 225 | 2.8989 | 6.483 | 18.829 | 0.20912 | 5.135 | 5.184 | 5.3931 |
| 56 | 230 | 2.9645 | 6.4874 | 18.777 | 0.20839 | 5.135 | 5.184 | 5.3924 |
| 57 | 235 | 3.0302 | 6.4918 | 18.934 | 0.21 | 5.1355 | 5.184 | 5.394 |
| 58 | 240 | 3.093 | 6.496 | 18.882 | 0.20928 | 5.1355 | 5.184 | 5.3933 |
| 59 | 245 | 3.1586 | 6.5004 | 18.882 | 0.20914 | 5.136 | 5.184 | 5.3931 |
| 60 | 250 | 3.2214 | 6.5046 | 18.882 | 0.209 | 5.1355 | 5.184 | 5.393 |
| 61 | 255 | 3.2871 | 6.509 | 18.934 | 0.20944 | 5.136 | 5.184 | 5.3934 |
| 62 | 260 | 3.3499 | 6.5133 | 18.987 | 0.20988 | 5.136 | 5.184 | 5.3939 |
| 63 | 265 | 3.4141 | 6.5176 | 18.987 | 0.20975 | 5.136 | 5.184 | 5.3937 |
| 64 | 270 | 3.4784 | 6.5219 | 18.829 | 0.20787 | 5.1339 | 5.184 | 5.3919 |
| 65 | 275 | 3.5426 | 6.5263 | 18.777 | 0.20715 | 5.1301 | 5.184 | 5.3912 |
| 66 | 280 | 3.6068 | 6.5306 | 18.829 | 0.20759 | 5.1317 | 5.184 | 5.3916 |
| 67 | 285 | 3.6696 | 6.5349 | 18.829 | 0.20746 | 5.1328 | 5.184 | 5.3915 |
| 68 | 285.36 | 3.6739 | 6.5352 | 18.829 | 0.20745 | 5.1328 | 5.184 | 5.3914 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3
Sample No.: ST-3
Test No.: 2 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/22/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 5.99 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.71 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

|  | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.184 | 5.184 | 0 | 0.000 | 0.14361 | 0.14361 | 1.000 | 0.14361 | 0 |
| 2 | 0.03 | 5.2056 | 5.184 | 0.0081516 | 0.378 | 0.15704 | 0.13545 | 1.159 | 0.14625 | 0.010795 |
| 3 | 0.05 | 5.2164 | 5.184 | 0.012499 | 0.386 | 0.16348 | 0.13111 | 1.247 | 0.1473 | 0.016189 |
| 4 | 0.08 | 5.2254 | 5.184 | 0.01576 | 0.381 | 0.16921 | 0.12785 | 1.324 | 0.14853 | 0.02068 |
| 5 | 0.10 | 5.2337 | 5.184 | 0.018477 | 0.371 | 0.17487 | 0.12513 | 1.397 | 0.15 | 0.024869 |
| 6 | 0.13 | 5.2409 | 5.184 | 0.021194 | 0.372 | 0.17933 | 0.12241 | 1.465 | 0.15087 | 0.028458 |
| 7 | 0.16 | 5.2481 | 5.184 | 0.021738 | 0.339 | 0.18596 | 0.12187 | 1.526 | 0.15391 | 0.032044 |
| 8 | 0.18 | 5.2541 | 5.184 | 0.020651 | 0.295 | 0.19302 | 0.12296 | 1.570 | 0.15799 | 0.03503 |
| 9 | 0.21 | 5.2594 | 5.184 | 0.020651 | 0.274 | 0.19839 | 0.12296 | 1.613 | 0.16067 | 0.037715 |
| 10 | 0.23 | 5.2648 | 5.184 | 0.023911 | 0.296 | 0.20049 | 0.11969 | 1.675 | 0.16009 | 0.040399 |
| 11 | 0.26 | 5.269 | 5.184 | 0.026085 | 0.307 | 0.20249 | 0.11752 | 1.723 | 0.16 | 0.042483 |
| 12 | 0.28 | 5.2737 | 5.184 | 0.028259 | 0.315 | 0.20507 | 0.11535 | 1.778 | 0.16021 | 0.044864 |
| 13 | 0.31 | 5.2785 | 5.184 | 0.031519 | 0.334 | 0.20658 | 0.11209 | 1.843 | 0.15933 | 0.047244 |
| 14 | 0.34 | 5.2826 | 5.184 | 0.033693 | 0.342 | 0.20856 | 0.10991 | 1.898 | 0.15924 | 0.049324 |
| 15 | 0.36 | 5.2874 | 5.184 | 0.035867 | 0.347 | 0.21114 | 0.10774 | 1.960 | 0.15944 | 0.051703 |
| 16 | 0.39 | 5.291 | 5.184 | 0.038041 | 0.356 | 0.21253 | 0.10557 | 2.013 | 0.15905 | 0.053481 |
| 17 | 0.45 | 5.2998 | 5.184 | 0.042388 | 0.366 | 0.21707 | 0.10122 | 2.145 | 0.15914 | 0.057925 |
| 18 | 0.52 | 5.3069 | 5.184 | 0.046736 | 0.380 | 0.21981 | 0.09687 | 2.269 | 0.15834 | 0.061469 |
| 19 | 0.58 | 5.3146 | 5.184 | 0.049996 | 0.383 | 0.22422 | 0.09361 | 2.395 | 0.15892 | 0.065306 |
| 20 | 0.65 | 5.3211 | 5.184 | 0.053257 | 0.388 | 0.22743 | 0.090349 | 2.517 | 0.15889 | 0.068542 |
| 21 | 0.71 | 5.3264 | 5.184 | 0.056518 | 0.397 | 0.22945 | 0.087088 | 2.635 | 0.15827 | 0.07118 |
| 22 | 0.77 | 5.3316 | 5.184 | 0.059235 | 0.401 | 0.232 | 0.084371 | 2.750 | 0.15818 | 0.073813 |
| 23 | 0.83 | 5.3357 | 5.184 | 0.061952 | 0.408 | 0.23335 | 0.081654 | 2.858 | 0.1575 | 0.075849 |
| 24 | 0.90 | 5.3409 | 5.184 | 0.065213 | 0.416 | 0.23534 | 0.078393 | 3.002 | 0.15687 | 0.078474 |
| 25 | 0.96 | 5.345 | 5.184 | 0.067386 | 0.419 | 0.23723 | 0.076219 | 3.112 | 0.15672 | 0.080504 |
| 26 | 1.02 | 5.3479 | 5.184 | 0.069017 | 0.421 | 0.23846 | 0.074589 | 3.197 | 0.15653 | 0.081937 |
| 27 | 1.09 | 5.3513 | 5.184 | 0.066843 | 0.399 | 0.24409 | 0.076763 | 3.180 | 0.16043 | 0.083665 |
| 28 | 1.15 | 5.3542 | 5.184 | 0.0663 | 0.390 | 0.24749 | 0.077306 | 3.201 | 0.1624 | 0.085093 |
| [illegible] | 1.21 | 5.3564 | 5.184 | 0.06956 | 0.403 | 0.24649 | 0.074046 | 3.329 | 0.16027 | 0.086225 |
| [illegible] | 1.28 | 5.3599 | 5.184 | 0.072277 | 0.411 | 0.24722 | 0.071329 | 3.466 | 0.15927 | 0.087944 |
| 31 | 1.34 | 5.3627 | 5.184 | 0.074451 | 0.417 | 0.24789 | 0.069155 | 3.585 | 0.15852 | 0.089366 |
| 32 | 1.41 | 5.3656 | 5.184 | 0.076081 | 0.419 | 0.24909 | 0.067524 | 3.689 | 0.15831 | 0.090784 |
| 33 | 1.48 | 5.3684 | 5.184 | 0.078255 | 0.424 | 0.24975 | 0.065351 | 3.822 | 0.15755 | 0.092201 |
| 34 | 1.54 | 5.3707 | 5.184 | 0.079885 | 0.428 | 0.25037 | 0.06372 | 3.929 | 0.15705 | 0.093325 |
| 35 | 1.60 | 5.3723 | 5.184 | 0.081516 | 0.433 | 0.25039 | 0.06209 | 4.033 | 0.15624 | 0.094151 |
| 36 | 1.67 | 5.3739 | 5.184 | 0.083146 | 0.438 | 0.25041 | 0.06046 | 4.142 | 0.15543 | 0.094973 |
| 37 | 1.73 | 5.3756 | 5.184 | 0.084233 | 0.440 | 0.25096 | 0.059373 | 4.227 | 0.15517 | 0.095795 |
| 38 | 1.79 | 5.3831 | 5.184 | 0.08532 | 0.428 | 0.25741 | 0.058286 | 4.416 | 0.15785 | 0.099563 |
| 39 | 1.86 | 5.3854 | 5.184 | 0.086407 | 0.429 | 0.25855 | 0.057199 | 4.520 | 0.15787 | 0.10068 |
| 40 | 1.92 | 5.3846 | 5.184 | 0.087494 | 0.436 | 0.25675 | 0.056112 | 4.576 | 0.15643 | 0.10032 |
| 41 | 1.98 | 5.3863 | 5.184 | 0.088037 | 0.435 | 0.25784 | 0.055569 | 4.640 | 0.1567 | 0.10113 |
| 42 | 2.05 | 5.3879 | 5.184 | 0.082059 | 0.402 | 0.26544 | 0.061547 | 4.313 | 0.16349 | 0.10195 |
| 43 | 2.12 | 5.3895 | 5.184 | 0.084233 | 0.410 | 0.26489 | 0.059373 | 4.462 | 0.16213 | 0.10276 |
| 44 | 2.18 | 5.3888 | 5.184 | 0.085863 | 0.419 | 0.26254 | 0.057743 | 4.547 | 0.16014 | 0.1024 |
| 45 | 2.25 | 5.3875 | 5.184 | 0.087494 | 0.430 | 0.2596 | 0.056112 | 4.626 | 0.15786 | 0.10174 |
| 46 | 2.31 | 5.3885 | 5.184 | 0.088581 | 0.433 | 0.25954 | 0.055025 | 4.717 | 0.15728 | 0.10226 |
| 47 | 2.38 | 5.389 | 5.184 | 0.089667 | 0.437 | 0.25891 | 0.053938 | 4.800 | 0.15642 | 0.10248 |
| 48 | 2.44 | 5.3882 | 5.184 | 0.090211 | 0.442 | 0.25764 | 0.053395 | 4.825 | 0.15552 | 0.10212 |
| 49 | 2.51 | 5.3881 | 5.184 | 0.090754 | 0.445 | 0.25696 | 0.052852 | 4.862 | 0.15491 | 0.10205 |
| 50 | 2.57 | 5.3886 | 5.184 | 0.091841 | 0.449 | 0.25632 | 0.051765 | 4.952 | 0.15404 | 0.10228 |
| 51 | 2.64 | 5.3902 | 5.184 | 0.092928 | 0.451 | 0.25685 | 0.050678 | 5.068 | 0.15376 | 0.10309 |
| 52 | 2.70 | 5.3918 | 5.184 | 0.093471 | 0.450 | 0.25792 | 0.050134 | 5.145 | 0.15403 | 0.10389 |
| 53 | 2.77 | 5.3916 | 5.184 | 0.093471 | 0.450 | 0.25778 | 0.050134 | 5.142 | 0.15396 | 0.10382 |
| 54 | 2.83 | 5.3915 | 5.184 | 0.094015 | 0.453 | 0.2571 | 0.049591 | 5.184 | 0.15334 | 0.10375 |
| 55 | 2.90 | 5.3931 | 5.184 | 0.094558 | 0.452 | 0.25816 | 0.049048 | 5.264 | 0.15361 | 0.10456 |
| 56 | 2.96 | 5.3924 | 5.184 | 0.094558 | 0.454 | 0.25744 | 0.049048 | 5.249 | 0.15324 | 0.1042 |
| 57 | 3.03 | 5.394 | 5.184 | 0.095102 | 0.453 | 0.2585 | 0.048504 | 5.329 | 0.1535 | 0.105 |
| 58 | 3.09 | 5.3933 | 5.184 | 0.095102 | 0.454 | 0.25778 | 0.048504 | 5.315 | 0.15314 | 0.10464 |
| 59 | 3.16 | 5.3931 | 5.184 | 0.095645 | 0.457 | 0.2571 | 0.047961 | 5.361 | 0.15253 | 0.10457 |
| 60 | 3.22 | 5.393 | 5.184 | 0.095102 | 0.455 | 0.25751 | 0.048504 | 5.309 | 0.15301 | 0.1045 |
| 61 | 3.29 | 5.3934 | 5.184 | 0.095645 | 0.457 | 0.2574 | 0.047961 | 5.367 | 0.15268 | 0.10472 |
| 62 | 3.35 | 5.3939 | 5.184 | 0.095645 | 0.456 | 0.25785 | 0.047961 | 5.376 | 0.1529 | 0.10494 |
| 63 | 3.41 | 5.3937 | 5.184 | 0.095645 | 0.456 | 0.25771 | 0.047961 | 5.373 | 0.15283 | 0.10487 |
| 64 | 3.48 | 5.3919 | 5.184 | 0.093471 | 0.450 | 0.258 | 0.050134 | 5.146 | 0.15407 | 0.10393 |
| 65 | 3.54 | 5.3912 | 5.184 | 0.089667 | 0.433 | 0.26109 | 0.053938 | 4.841 | 0.15751 | 0.10358 |
| 66 | 3.61 | 5.3916 | 5.184 | 0.091298 | 0.440 | 0.2599 | 0.052308 | 4.969 | 0.1561 | 0.1038 |
| 67 | 3.67 | 5.3915 | 5.184 | 0.092385 | 0.445 | 0.25868 | 0.051221 | 5.050 | 0.15495 | 0.10373 |
| 68 | 3.67 | 5.3914 | 5.184 | 0.092385 | 0.445 | 0.25867 | 0.051221 | 5.050 | 0.15494 | 0.10372 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE2
Sample No.: STAGE 2
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/28/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Sp[illegible]men Height: 5.30 in
Specimen Area: 6.54 in^2
Specimen Volume: 34.65 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.5354 | 0 | 0 | 5.0415 | 5.8392 | 5.8392 |
| 2 | 2.004 | 0.027418 | 6.5372 | 3.9337 | 0.043325 | 5.0643 | 5.8392 | 5.8825 |
| 3 | 4.0038 | 0.056448 | 6.5391 | 6.8708 | 0.075652 | 5.0833 | 5.8392 | 5.9149 |
| 4 | 6.0038 | 0.083866 | 6.5409 | 9.4933 | 0.1045 | 5.1007 | 5.8392 | 5.9437 |
| 5 | 8.0038 | 0.11451 | 6.5429 | 11.958 | 0.13159 | 5.1094 | 5.8392 | 5.9708 |
| 6 | 10.004 | 0.14193 | 6.5447 | 14.266 | 0.15695 | 5.1214 | 5.8392 | 5.9961 |
| 7 | 12.004 | 0.17096 | 6.5466 | 16.207 | 0.17824 | 5.1398 | 5.8392 | 6.0174 |
| 8 | 14.004 | 0.19999 | 6.5485 | 17.938 | 0.19722 | 5.1556 | 5.8392 | 6.0364 |
| 9 | 16.004 | 0.22902 | 6.5504 | 19.354 | 0.21273 | 5.1703 | 5.8392 | 6.0519 |
| 10 | 18.004 | 0.25805 | 6.5523 | 20.665 | 0.22708 | 5.1844 | 5.8392 | 6.0663 |
| 11 | 20.004 | 0.28708 | 6.5543 | 21.871 | 0.24026 | 5.198 | 5.8392 | 6.0795 |
| 12 | 22.004 | 0.31772 | 6.5563 | 23.078 | 0.25343 | 5.2105 | 5.8392 | 6.0926 |
| 13 | 24.004 | 0.34675 | 6.5582 | 24.179 | 0.26545 | 5.2235 | 5.8392 | 6.1047 |
| 14 | 26.004 | 0.37578 | 6.5601 | 25.28 | 0.27746 | 5.2349 | 5.8392 | 6.1167 |
| 15 | 28 | 0.40481 | 6.562 | 26.329 | 0.28889 | 5.2464 | 5.8392 | 6.1281 |
| 16 | 30 | 0.43223 | 6.5638 | 27.536 | 0.30205 | 5.2578 | 5.8392 | 6.1412 |
| 17 | 35 | 0.50642 | 6.5687 | 29.896 | 0.32769 | 5.2833 | 5.8392 | 6.1669 |
| 18 | 40 | 0.59351 | 6.5745 | 2.5176 | 0.027571 | 5.0975 | 5.8392 | 5.8668 |
| 19 | 45 | 0.66286 | 6.5791 | 11.486 | 0.1257 | 5.1779 | 5.8392 | 5.9649 |
| 20 | 50 | 0.72899 | 6.5834 | 17.675 | 0.19331 | 5.223 | 5.8392 | 6.0325 |
| 21 | 55 | 0.79834 | 6.588 | 23.13 | 0.25279 | 5.2561 | 5.8392 | 6.092 |
| 22 | 60.001 | 0.87091 | 6.5929 | 28.008 | 0.30587 | 5.2855 | 5.8392 | 6.1451 |
| 23 | 65.001 | 0.94349 | 6.5977 | 31.837 | 0.34743 | 5.3121 | 5.8392 | 6.1866 |
| 24 | 70.001 | 1.0161 | 6.6025 | 12.011 | 0.13098 | 5.1915 | 5.8392 | 5.9702 |
| 25 | 75.001 | 1.0838 | 6.607 | 20.35 | 0.22177 | 5.2464 | 5.8392 | 6.061 |
| 26 | 80.001 | 1.1515 | 6.6116 | 26.434 | 0.28787 | 5.2714 | 5.8392 | 6.1271 |
| 27 | 85.001 | 1.2209 | 6.6162 | 31.365 | 0.34132 | 5.3072 | 5.8392 | 6.1805 |
| 28 | 90.001 | 1.2919 | 6.621 | 34.931 | 0.37986 | 5.3344 | 5.8392 | 6.2191 |
| 29 | 95.001 | 1.3628 | 6.6257 | 37.344 | 0.4058 | 5.3572 | 5.8392 | 6.245 |
| [illegible] | 100 | 1.4322 | 6.6304 | 38.917 | 0.42261 | 5.3762 | 5.8392 | 6.2618 |
| [illegible] | 105 | 1.5015 | 6.6351 | 40.438 | 0.43881 | 5.3931 | 5.8392 | 6.278 |
| 32 | 110 | 1.5741 | 6.64 | 41.749 | 0.45271 | 5.4023 | 5.8392 | 6.2919 |
| 33 | 115 | 1.6467 | 6.6449 | 43.113 | 0.46715 | 5.417 | 5.8392 | 6.3064 |
| 34 | 120 | 1.7176 | 6.6497 | 44.372 | 0.48044 | 5.4328 | 5.8392 | 6.3196 |
| 35 | 125 | 1.7918 | 6.6547 | 45.211 | 0.48916 | 5.4469 | 5.8392 | 6.3284 |
| 36 | 130 | 1.866 | 6.6597 | 45.736 | 0.49446 | 5.4599 | 5.8392 | 6.3337 |
| 37 | 135 | 1.937 | 6.6645 | 46.522 | 0.5026 | 5.4724 | 5.8392 | 6.3418 |
| 38 | 140 | 2.0079 | 6.6694 | 47.204 | 0.5096 | 5.4833 | 5.8392 | 6.3488 |
| 39 | 145 | 2.0805 | 6.6743 | 47.624 | 0.51375 | 5.4849 | 5.8392 | 6.3529 |
| 40 | 150 | 2.1547 | 6.6794 | 47.991 | 0.51732 | 5.4963 | 5.8392 | 6.3565 |
| 41 | 155 | 2.2289 | 6.6844 | 48.778 | 0.5254 | 5.5072 | 5.8392 | 6.3646 |
| 42 | 160 | 2.3031 | 6.6895 | 49.04 | 0.52782 | 5.5164 | 5.8392 | 6.367 |
| 43 | 165 | 2.3773 | 6.6946 | 49.722 | 0.53476 | 5.5257 | 5.8392 | 6.374 |
| 44 | 170 | 2.4515 | 6.6997 | 50.089 | 0.53829 | 5.5333 | 5.8392 | 6.3775 |
| 45 | 175 | 2.5273 | 6.7049 | 50.718 | 0.54463 | 5.5409 | 5.8392 | 6.3838 |
| 46 | 180 | 2.6031 | 6.7101 | 51.715 | 0.5549 | 5.5387 | 5.8392 | 6.3941 |
| 47 | 185 | 2.6789 | 6.7153 | 51.977 | 0.55728 | 5.548 | 5.8392 | 6.3965 |
| 48 | 190 | 2.7531 | 6.7205 | 51.977 | 0.55686 | 5.5556 | 5.8392 | 6.3961 |
| 49 | 195 | 2.8256 | 6.7255 | 52.03 | 0.55701 | 5.5621 | 5.8392 | 6.3962 |
| 50 | 200 | 2.9014 | 6.7307 | 52.187 | 0.55825 | 5.5681 | 5.8392 | 6.3975 |
| 51 | 205 | 2.9756 | 6.7359 | 52.134 | 0.55727 | 5.5735 | 5.8392 | 6.3965 |
| 52 | 210 | 3.0498 | 6.741 | 52.134 | 0.55684 | 5.5789 | 5.8392 | 6.396 |
| 53 | 215 | 3.1256 | 6.7463 | 52.082 | 0.55585 | 5.5757 | 5.8392 | 6.395 |
| 54 | 220 | 3.1982 | 6.7514 | 53.655 | 0.57221 | 5.5806 | 5.8392 | 6.4114 |
| 55 | 225 | 3.2708 | 6.7564 | 53.865 | 0.57402 | 5.5871 | 5.8392 | 6.4132 |
| 56 | 230 | 3.3433 | 6.7615 | 53.865 | 0.57359 | 5.5914 | 5.8392 | 6.4128 |
| 57 | 235 | 3.4159 | 6.7666 | 53.865 | 0.57315 | 5.5963 | 5.8392 | 6.4124 |
| 58 | 240 | 3.4869 | 6.7716 | 53.97 | 0.57385 | 5.6007 | 5.8392 | 6.413 |
| 59 | 245 | 3.5611 | 6.7768 | 53.813 | 0.57174 | 5.6045 | 5.8392 | 6.4109 |
| 60 | 250 | 3.632 | 6.7818 | 53.918 | 0.57243 | 5.6077 | 5.8392 | 6.4116 |
| 61 | 255 | 3.7062 | 6.787 | 53.97 | 0.57254 | 5.6023 | 5.8392 | 6.4117 |
| 62 | 260 | 3.7788 | 6.7921 | 54.023 | 0.57267 | 5.6088 | 5.8392 | 6.4119 |
| 63 | 265 | 3.8514 | 6.7972 | 54.127 | 0.57335 | 5.6126 | 5.8392 | 6.4125 |
| 64 | 270 | 3.9207 | 6.8021 | 54.127 | 0.57293 | 5.6159 | 5.8392 | 6.4121 |
| 65 | 275 | 3.9949 | 6.8074 | 54.075 | 0.57194 | 5.6192 | 5.8392 | 6.4111 |
| 66 | 280 | 4.0675 | 6.8125 | 54.075 | 0.57151 | 5.6219 | 5.8392 | 6.4107 |
| 67 | 285 | 4.1417 | 6.8178 | 53.97 | 0.56996 | 5.624 | 5.8392 | 6.4092 |
| 68 | 290 | 4.2143 | 6.823 | 54.285 | 0.57284 | 5.6159 | 5.8392 | 6.412 |
| 69 | 295 | 4.2884 | 6.8283 | 53.97 | 0.56908 | 5.623 | 5.8392 | 6.4083 |
| 70 | 300 | 4.3642 | 6.8337 | 53.97 | 0.56863 | 5.6257 | 5.8392 | 6.4078 |
| [illegible] | 305 | 4.4368 | 6.8389 | 54.023 | 0.56875 | 5.6289 | 5.8392 | 6.408 |
| [illegible] | 310 | 4.5094 | 6.8441 | 54.023 | 0.56832 | 5.6311 | 5.8392 | 6.4075 |
| 73 | 315 | 4.5852 | 6.8495 | 54.023 | 0.56787 | 5.6333 | 5.8392 | 6.4071 |
| 74 | 320 | 4.6594 | 6.8548 | 53.813 | 0.56522 | 5.6349 | 5.8392 | 6.4044 |
| 75 | 325 | 4.7304 | 6.8599 | 53.603 | 0.5626 | 5.6273 | 5.8392 | 6.4018 |
| 76 | 330 | 4.8029 | 6.8652 | 53.236 | 0.55832 | 5.6327 | 5.8392 | 6.3975 |
| 77 | 335 | 4.8787 | 6.8706 | 53.288 | 0.55843 | 5.6349 | 5.8392 | 6.3976 |
| 78 | 340 | 4.9513 | 6.8759 | 53.078 | 0.5558 | 5.6371 | 5.8392 | 6.395 |
| 79 | 345 | 5.0255 | 6.8813 | 52.974 | 0.55427 | 5.6387 | 5.8392 | 6.3935 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 80 | 350 | 5.1029 | 6.8869 | 52.974 | 0.55382 | 5.6409 | 5.8392 | 6.393 |
| 81 | 355 | 5.1787 | 6.8924 | 52.554 | 0.549 | 5.6365 | 5.8392 | 6.3882 |
| 82 | 360 | 5.2529 | 6.8978 | 52.659 | 0.54966 | 5.636 | 5.8392 | 6.3889 |
| 83 | 365 | 5.3271 | 6.9032 | 52.711 | 0.54978 | 5.6398 | 5.8392 | 6.389 |
| 84 | 370 | 5.4029 | 6.9087 | 52.292 | 0.54497 | 5.642 | 5.8392 | 6.3842 |
| 85 | 375 | 5.4787 | 6.9143 | 52.187 | 0.54344 | 5.6436 | 5.8392 | 6.3826 |
| 86 | 380 | 5.5529 | 6.9197 | 52.03 | 0.54137 | 5.6452 | 5.8392 | 6.3806 |
| 87 | 381.27 | 5.5706 | 6.921 | 52.03 | 0.54127 | 5.6458 | 5.8392 | 6.3805 |

# TRIAXIAL TEST

**AECOM**

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE2
Sample No.: STAGE 2
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/28/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 5.30 in
Specimen Area: 6.54 in^2
Specimen Volume: 34.65 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.8392 | 5.8392 | 0 | 0.000 | 0.79772 | 0.79772 | 1.000 | 0.79772 | 0 |
| 2 | 0.03 | 5.8825 | 5.8392 | 0.022824 | 0.527 | 0.81822 | 0.77489 | 1.056 | 0.79656 | 0.021662 |
| 3 | 0.06 | 5.9149 | 5.8392 | 0.041845 | 0.553 | 0.83153 | 0.75587 | 1.100 | 0.7937 | 0.037826 |
| 4 | 0.08 | 5.9437 | 5.8392 | 0.059235 | 0.567 | 0.84298 | 0.73848 | 1.142 | 0.79073 | 0.052249 |
| 5 | 0.11 | 5.9708 | 5.8392 | 0.06793 | 0.516 | 0.86138 | 0.72979 | 1.180 | 0.79559 | 0.065797 |
| 6 | 0.14 | 5.9961 | 5.8392 | 0.079885 | 0.509 | 0.87478 | 0.71783 | 1.219 | 0.79631 | 0.078473 |
| 7 | 0.17 | 6.0174 | 5.8392 | 0.098362 | 0.552 | 0.8776 | 0.69936 | 1.255 | 0.78848 | 0.089121 |
| 8 | 0.20 | 6.0364 | 5.8392 | 0.11412 | 0.579 | 0.88082 | 0.6836 | 1.289 | 0.78221 | 0.09861 |
| 9 | 0.23 | 6.0519 | 5.8392 | 0.12879 | 0.605 | 0.88165 | 0.66892 | 1.318 | 0.77529 | 0.10636 |
| 10 | 0.26 | 6.0663 | 5.8392 | 0.14292 | 0.629 | 0.88187 | 0.65479 | 1.347 | 0.76833 | 0.11354 |
| 11 | 0.29 | 6.0795 | 5.8392 | 0.15651 | 0.651 | 0.88147 | 0.64121 | 1.375 | 0.76134 | 0.12013 |
| 12 | 0.32 | 6.0926 | 5.8392 | 0.16901 | 0.667 | 0.88214 | 0.62871 | 1.403 | 0.75543 | 0.12672 |
| 13 | 0.35 | 6.1047 | 5.8392 | 0.18205 | 0.686 | 0.88112 | 0.61567 | 1.431 | 0.74839 | 0.13273 |
| 14 | 0.38 | 6.1167 | 5.8392 | 0.19346 | 0.697 | 0.88172 | 0.60425 | 1.459 | 0.74299 | 0.13873 |
| 15 | 0.40 | 6.1281 | 5.8392 | 0.20488 | 0.709 | 0.88174 | 0.59284 | 1.487 | 0.73729 | 0.14445 |
| 16 | 0.43 | 6.1412 | 5.8392 | 0.21629 | 0.716 | 0.88348 | 0.58143 | 1.519 | 0.73245 | 0.15102 |
| 17 | 0.51 | 6.1669 | 5.8392 | 0.24183 | 0.738 | 0.88358 | 0.55589 | 1.589 | 0.71973 | 0.16385 |
| 18 | 0.59 | 5.8668 | 5.8392 | 0.055974 | 2.030 | 0.76932 | 0.74174 | 1.037 | 0.75553 | 0.013785 |
| 19 | 0.66 | 5.9649 | 5.8392 | 0.1364 | 1.085 | 0.78702 | 0.66132 | 1.190 | 0.72417 | 0.062852 |
| 20 | 0.73 | 6.0325 | 5.8392 | 0.18151 | 0.939 | 0.80952 | 0.61621 | 1.314 | 0.71286 | 0.096654 |
| 21 | 0.80 | 6.092 | 5.8392 | 0.21466 | 0.849 | 0.83585 | 0.58306 | 1.434 | 0.70945 | 0.12639 |
| 22 | 0.87 | 6.1451 | 5.8392 | 0.244 | 0.798 | 0.85959 | 0.55372 | 1.552 | 0.70665 | 0.15294 |
| 23 | 0.94 | 6.1866 | 5.8392 | 0.27063 | 0.779 | 0.87452 | 0.52709 | 1.659 | 0.7008 | 0.17372 |
| 24 | 1.02 | 5.9702 | 5.8392 | 0.14999 | 1.145 | 0.77871 | 0.64773 | 1.202 | 0.71322 | 0.065489 |
| 25 | 1.08 | 6.061 | 5.8392 | 0.20488 | 0.924 | 0.81461 | 0.59284 | 1.374 | 0.70373 | 0.11088 |
| 26 | 1.15 | 6.1271 | 5.8392 | 0.22987 | 0.799 | 0.85571 | 0.56784 | 1.507 | 0.71178 | 0.14393 |
| 27 | 1.22 | 6.1805 | 5.8392 | 0.26574 | 0.779 | 0.8733 | 0.53198 | 1.642 | 0.70264 | 0.17066 |
| 28 | 1.29 | 6.2191 | 5.8392 | 0.29291 | 0.771 | 0.88466 | 0.50481 | 1.752 | 0.69474 | 0.18993 |
| [illegible] | 1.36 | 6.245 | 5.8392 | 0.31574 | 0.778 | 0.88779 | 0.48198 | 1.842 | 0.68488 | 0.2029 |
| [illegible] | 1.43 | 6.2618 | 5.8392 | 0.33476 | 0.792 | 0.88557 | 0.46296 | 1.913 | 0.67426 | 0.2113 |
| 31 | 1.50 | 6.278 | 5.8392 | 0.3516 | 0.801 | 0.88493 | 0.44611 | 1.984 | 0.66552 | 0.21941 |
| 32 | 1.57 | 6.2919 | 5.8392 | 0.36084 | 0.797 | 0.88958 | 0.43688 | 2.036 | 0.66323 | 0.22635 |
| 33 | 1.65 | 6.3064 | 5.8392 | 0.37552 | 0.804 | 0.88935 | 0.4222 | 2.106 | 0.65578 | 0.23358 |
| 34 | 1.72 | 6.3196 | 5.8392 | 0.39128 | 0.814 | 0.88689 | 0.40644 | 2.182 | 0.64666 | 0.24022 |
| 35 | 1.79 | 6.3284 | 5.8392 | 0.40541 | 0.829 | 0.88147 | 0.39231 | 2.247 | 0.63689 | 0.24458 |
| 36 | 1.87 | 6.3337 | 5.8392 | 0.41845 | 0.846 | 0.87373 | 0.37927 | 2.304 | 0.6265 | 0.24723 |
| 37 | 1.94 | 6.3418 | 5.8392 | 0.43095 | 0.857 | 0.86937 | 0.36677 | 2.370 | 0.61807 | 0.2513 |
| 38 | 2.01 | 6.3488 | 5.8392 | 0.44182 | 0.867 | 0.8655 | 0.3559 | 2.432 | 0.6107 | 0.2548 |
| 39 | 2.08 | 6.3529 | 5.8392 | 0.44345 | 0.863 | 0.86802 | 0.35427 | 2.450 | 0.61115 | 0.25687 |
| 40 | 2.15 | 6.3565 | 5.8392 | 0.45486 | 0.879 | 0.86018 | 0.34286 | 2.509 | 0.60152 | 0.25866 |
| 41 | 2.23 | 6.3646 | 5.8392 | 0.46573 | 0.886 | 0.85739 | 0.33199 | 2.583 | 0.59469 | 0.2627 |
| 42 | 2.30 | 6.367 | 5.8392 | 0.47497 | 0.900 | 0.85058 | 0.32275 | 2.635 | 0.58666 | 0.26391 |
| 43 | 2.38 | 6.374 | 5.8392 | 0.4842 | 0.905 | 0.84827 | 0.31352 | 2.706 | 0.58089 | 0.26738 |
| 44 | 2.45 | 6.3775 | 5.8392 | 0.49181 | 0.914 | 0.8442 | 0.30591 | 2.760 | 0.57505 | 0.26915 |
| 45 | 2.53 | 6.3838 | 5.8392 | 0.49942 | 0.917 | 0.84293 | 0.2983 | 2.826 | 0.57062 | 0.27232 |
| 46 | 2.60 | 6.3941 | 5.8392 | 0.49725 | 0.896 | 0.85538 | 0.30047 | 2.847 | 0.57792 | 0.27745 |
| 47 | 2.68 | 6.3965 | 5.8392 | 0.50648 | 0.909 | 0.84852 | 0.29123 | 2.914 | 0.56988 | 0.27864 |
| 48 | 2.75 | 6.3961 | 5.8392 | 0.51409 | 0.923 | 0.84049 | 0.28363 | 2.963 | 0.56206 | 0.27843 |
| 49 | 2.83 | 6.3962 | 5.8392 | 0.52061 | 0.935 | 0.83411 | 0.2771 | 3.010 | 0.55561 | 0.2785 |
| 50 | 2.90 | 6.3975 | 5.8392 | 0.52659 | 0.943 | 0.82938 | 0.27113 | 3.059 | 0.55025 | 0.27913 |
| 51 | 2.98 | 6.3965 | 5.8392 | 0.53203 | 0.955 | 0.82296 | 0.26569 | 3.097 | 0.54433 | 0.27863 |
| 52 | 3.05 | 6.396 | 5.8392 | 0.53746 | 0.965 | 0.8171 | 0.26026 | 3.140 | 0.53868 | 0.27842 |
| 53 | 3.13 | 6.395 | 5.8392 | 0.5342 | 0.961 | 0.81936 | 0.26352 | 3.109 | 0.54144 | 0.27792 |
| 54 | 3.20 | 6.4114 | 5.8392 | 0.53909 | 0.942 | 0.83084 | 0.25863 | 3.212 | 0.54473 | 0.2861 |
| 55 | 3.27 | 6.4132 | 5.8392 | 0.54561 | 0.951 | 0.82612 | 0.25211 | 3.277 | 0.53911 | 0.28701 |
| 56 | 3.34 | 6.4128 | 5.8392 | 0.54996 | 0.959 | 0.82134 | 0.24776 | 3.315 | 0.53455 | 0.28679 |
| 57 | 3.42 | 6.4124 | 5.8392 | 0.55485 | 0.968 | 0.81602 | 0.24287 | 3.360 | 0.52945 | 0.28658 |
| 58 | 3.49 | 6.413 | 5.8392 | 0.5592 | 0.974 | 0.81237 | 0.23852 | 3.406 | 0.52544 | 0.28692 |
| 59 | 3.56 | 6.4109 | 5.8392 | 0.563 | 0.985 | 0.80645 | 0.23472 | 3.436 | 0.52058 | 0.28587 |
| 60 | 3.63 | 6.4116 | 5.8392 | 0.56626 | 0.989 | 0.80388 | 0.23146 | 3.473 | 0.51767 | 0.28621 |
| 61 | 3.71 | 6.4117 | 5.8392 | 0.56083 | 0.980 | 0.80943 | 0.23689 | 3.417 | 0.52316 | 0.28627 |
| 62 | 3.78 | 6.4119 | 5.8392 | 0.56735 | 0.991 | 0.80304 | 0.23037 | 3.486 | 0.5167 | 0.28633 |
| 63 | 3.85 | 6.4125 | 5.8392 | 0.57115 | 0.996 | 0.79991 | 0.22656 | 3.531 | 0.51324 | 0.28667 |
| 64 | 3.92 | 6.4121 | 5.8392 | 0.57441 | 1.003 | 0.79624 | 0.2233 | 3.566 | 0.50977 | 0.28647 |
| 65 | 3.99 | 6.4111 | 5.8392 | 0.57768 | 1.010 | 0.79198 | 0.22004 | 3.599 | 0.50601 | 0.28597 |
| 66 | 4.07 | 6.4107 | 5.8392 | 0.58039 | 1.016 | 0.78883 | 0.21733 | 3.630 | 0.50308 | 0.28575 |
| 67 | 4.14 | 6.4092 | 5.8392 | 0.58257 | 1.022 | 0.78511 | 0.21515 | 3.649 | 0.50013 | 0.28498 |
| 68 | 4.21 | 6.412 | 5.8392 | 0.57441 | 1.003 | 0.79615 | 0.2233 | 3.565 | 0.50973 | 0.28642 |
| 69 | 4.29 | 6.4083 | 5.8392 | 0.58148 | 1.022 | 0.78532 | 0.21624 | 3.632 | 0.50078 | 0.28454 |
| [illegible] | 4.36 | 6.4078 | 5.8392 | 0.5842 | 1.027 | 0.78215 | 0.21352 | 3.663 | 0.49784 | 0.28432 |
| [illegible] | 4.44 | 6.408 | 5.8392 | 0.58746 | 1.033 | 0.77901 | 0.21026 | 3.705 | 0.49464 | 0.28438 |
| 72 | 4.51 | 6.4075 | 5.8392 | 0.58963 | 1.037 | 0.77641 | 0.20809 | 3.731 | 0.49225 | 0.28416 |
| 73 | 4.59 | 6.4071 | 5.8392 | 0.5918 | 1.042 | 0.77378 | 0.20591 | 3.758 | 0.48985 | 0.28393 |
| 74 | 4.66 | 6.4044 | 5.8392 | 0.59344 | 1.050 | 0.76951 | 0.20428 | 3.767 | 0.4869 | 0.28261 |
| 75 | 4.73 | 6.4018 | 5.8392 | 0.58583 | 1.041 | 0.77449 | 0.21189 | 3.655 | 0.49319 | 0.2813 |
| 76 | 4.80 | 6.3975 | 5.8392 | 0.59126 | 1.059 | 0.76478 | 0.20646 | 3.704 | 0.48562 | 0.27916 |
| 77 | 4.88 | 6.3976 | 5.8392 | 0.59344 | 1.063 | 0.76271 | 0.20428 | 3.734 | 0.4835 | 0.27921 |
| 78 | 4.95 | 6.395 | 5.8392 | 0.59561 | 1.072 | 0.75792 | 0.20211 | 3.750 | 0.48001 | 0.2779 |

|  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 5.03 | 6.3935 | 5.8392 | 0.59724 | 1.078 | 0.75475 | 0.20048 | 3.765 | 0.47762 | 0.27714 |
| 80 | 5.10 | 6.393 | 5.8392 | 0.59941 | 1.082 | 0.75213 | 0.19831 | 3.793 | 0.47522 | 0.27691 |
| 81 | 5.18 | 6.3882 | 5.8392 | 0.59507 | 1.084 | 0.75165 | 0.20265 | 3.709 | 0.47715 | 0.2745 |
| 82 | 5.25 | 6.3889 | 5.8392 | 0.59452 | 1.082 | 0.75286 | 0.2032 | 3.705 | 0.47803 | 0.27483 |
| 83 | 5.33 | 6.389 | 5.8392 | 0.59833 | 1.088 | 0.74917 | 0.19939 | 3.757 | 0.47428 | 0.27489 |
| 84 | 5.40 | 6.3842 | 5.8392 | 0.6005 | 1.102 | 0.74218 | 0.19722 | 3.763 | 0.4697 | 0.27248 |
| 85 | 5.48 | 6.3826 | 5.8392 | 0.60213 | 1.108 | 0.73903 | 0.19559 | 3.778 | 0.46731 | 0.27172 |
| 86 | 5.55 | 6.3806 | 5.8392 | 0.60376 | 1.115 | 0.73533 | 0.19396 | 3.791 | 0.46464 | 0.27069 |
|  | 5.57 | 6.3805 | 5.8392 | 0.6043 | 1.116 | 0.73469 | 0.19342 | 3.798 | 0.46405 | 0.27064 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE3
Sample No.: ST-3
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/29/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 4.82 in
Specimen Area: 6.67 in^2
Specimen Volume: 32.13 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.6663 | 0 | 0 | 5.0437 | 7.0416 | 7.0416 |
| 2 | 5 | 0.078052 | 6.6715 | 7.8149 | 0.08434 | 5.4844 | 7.0416 | 7.1259 |
| 3 | 10 | 0.15788 | 6.6769 | 13.847 | 0.14931 | 5.6056 | 7.0416 | 7.1909 |
| 4 | 15 | 0.23593 | 6.6821 | 18.882 | 0.20345 | 5.6882 | 7.0416 | 7.2451 |
| 5 | 20 | 0.31221 | 6.6872 | 23.287 | 0.25073 | 5.7539 | 7.0416 | 7.2923 |
| 6 | 25 | 0.39026 | 6.6924 | 27.378 | 0.29455 | 5.7974 | 7.0416 | 7.3361 |
| 7 | 30 | 0.46831 | 6.6977 | 31.102 | 0.33435 | 5.8512 | 7.0416 | 7.3759 |
| 8 | 35.001 | 0.54636 | 6.7029 | 34.616 | 0.37183 | 5.9023 | 7.0416 | 7.4134 |
| 9 | 40.001 | 0.62619 | 6.7083 | 37.973 | 0.40756 | 5.9447 | 7.0416 | 7.4492 |
| 10 | 45.001 | 0.71489 | 6.7143 | 22.081 | 0.23678 | 5.8653 | 7.0416 | 7.2784 |
| 11 | 50.001 | 0.78939 | 6.7194 | 31.26 | 0.33496 | 5.9349 | 7.0416 | 7.3766 |
| 12 | 55.001 | 0.86744 | 6.7246 | 37.921 | 0.40601 | 5.9833 | 7.0416 | 7.4476 |
| 13 | 60.001 | 0.94372 | 6.7298 | 42.484 | 0.45452 | 6.0213 | 7.0416 | 7.4961 |
| 14 | 70.001 | 1.1016 | 6.7406 | 48.673 | 0.5199 | 6.0822 | 7.0416 | 7.5615 |
| 15 | 80.001 | 1.2577 | 6.7512 | 53.446 | 0.56998 | 6.1414 | 7.0416 | 7.6116 |
| 16 | 90.002 | 1.4245 | 6.7626 | 57.746 | 0.61481 | 6.1947 | 7.0416 | 7.6564 |
| 17 | 100 | 1.5788 | 6.7733 | 61.103 | 0.64953 | 6.224 | 7.0416 | 7.6911 |
| 18 | 110 | 1.7384 | 6.7843 | 64.198 | 0.68132 | 6.2794 | 7.0416 | 7.7229 |
| 19 | 120 | 1.8963 | 6.7952 | 66.768 | 0.70745 | 6.3191 | 7.0416 | 7.7491 |
| 20 | 130 | 2.056 | 6.8062 | 69.233 | 0.73238 | 6.3539 | 7.0416 | 7.774 |
| 21 | 140 | 2.2192 | 6.8176 | 71.593 | 0.75609 | 6.3778 | 7.0416 | 7.7977 |
| 22 | 150 | 2.3806 | 6.8289 | 73.324 | 0.77309 | 6.4099 | 7.0416 | 7.8147 |
| 23 | 160 | 2.5456 | 6.8404 | 75.369 | 0.79331 | 6.4365 | 7.0416 | 7.8349 |
| 24 | 170 | 2.707 | 6.8518 | 76.995 | 0.80908 | 6.4419 | 7.0416 | 7.8507 |
| 25 | 180 | 2.8684 | 6.8632 | 78.254 | 0.82094 | 6.4772 | 7.0416 | 7.8625 |
| 26 | 190 | 3.0298 | 6.8746 | 79.46 | 0.83221 | 6.4979 | 7.0416 | 7.8738 |
| 27 | 200 | 3.1913 | 6.8861 | 80.3 | 0.8396 | 6.499 | 7.0416 | 7.8812 |
| 28 | 210 | 3.3545 | 6.8977 | 81.401 | 0.84969 | 6.5267 | 7.0416 | 7.8913 |
| 29 | 220 | 3.5123 | 6.909 | 82.135 | 0.85595 | 6.5446 | 7.0416 | 7.8975 |
| [illegible] | 230 | 3.6738 | 6.9206 | 82.922 | 0.8627 | 6.5588 | 7.0416 | 7.9043 |
| [illegible] | 240 | 3.8352 | 6.9322 | 83.919 | 0.87161 | 6.5588 | 7.0416 | 7.9132 |
| 32 | 270 | 4.3248 | 6.9677 | 84.81 | 0.87638 | 6.5838 | 7.0416 | 7.918 |
| 33 | 300 | 4.8073 | 7.003 | 85.44 | 0.87843 | 6.612 | 7.0416 | 7.92 |
| 34 | 330 | 5.2934 | 7.0389 | 86.017 | 0.87985 | 6.6283 | 7.0416 | 7.9215 |
| 35 | 360 | 5.7759 | 7.075 | 84.968 | 0.86469 | 6.6408 | 7.0416 | 7.9063 |
| 36 | 390 | 6.2548 | 7.1111 | 84.443 | 0.85499 | 6.6479 | 7.0416 | 7.8966 |
| 37 | 420 | 6.7391 | 7.148 | 82.765 | 0.83366 | 6.6631 | 7.0416 | 7.8753 |
| 38 | 450 | 7.2234 | 7.1853 | 81.978 | 0.82145 | 6.6691 | 7.0416 | 7.8631 |
| 39 | 480 | 7.713 | 7.2235 | 81.978 | 0.81712 | 6.674 | 7.0416 | 7.8587 |
| 40 | 510 | 8.199 | 7.2617 | 81.349 | 0.80657 | 6.6772 | 7.0416 | 7.8482 |
| 41 | 540 | 8.6833 | 7.3002 | 81.139 | 0.80025 | 6.6816 | 7.0416 | 7.8418 |
| 42 | 570 | 9.1623 | 7.3387 | 79.88 | 0.7837 | 6.6854 | 7.0416 | 7.8253 |
| 43 | 600 | 9.6448 | 7.3779 | 80.09 | 0.78159 | 6.6881 | 7.0416 | 7.8232 |
| 44 | 630 | 10.133 | 7.4179 | 80.142 | 0.77788 | 6.6908 | 7.0416 | 7.8195 |
| 45 | 660 | 10.615 | 7.458 | 81.821 | 0.7899 | 6.693 | 7.0416 | 7.8315 |
| 46 | 690 | 11.105 | 7.4991 | 80.981 | 0.77752 | 6.6941 | 7.0416 | 7.8191 |
| 47 | 720 | 11.585 | 7.5398 | 81.873 | 0.78183 | 6.6957 | 7.0416 | 7.8234 |
| 48 | 750 | 12.066 | 7.5811 | 81.558 | 0.77459 | 6.6957 | 7.0416 | 7.8162 |
| 49 | 780 | 12.549 | 7.6229 | 81.558 | 0.77034 | 6.6963 | 7.0416 | 7.8119 |
| 50 | 810 | 13.038 | 7.6658 | 79.408 | 0.74583 | 6.6941 | 7.0416 | 7.7874 |
| 51 | 840 | 13.523 | 7.7087 | 79.355 | 0.74118 | 6.6946 | 7.0416 | 7.7828 |
| 52 | 870 | 14.009 | 7.7523 | 79.67 | 0.73994 | 6.6946 | 7.0416 | 7.7815 |
| 53 | 899.04 | 14.47 | 7.7941 | 80.09 | 0.73985 | 6.6946 | 7.0416 | 7.7814 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE3
Sample No.: ST-3
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/29/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED  AS PER ASTM D 4767.

Sp[illegible]men Height: 4.82 in
Specimen Area: 6.67 in^2
Specimen Volume: 32.13 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

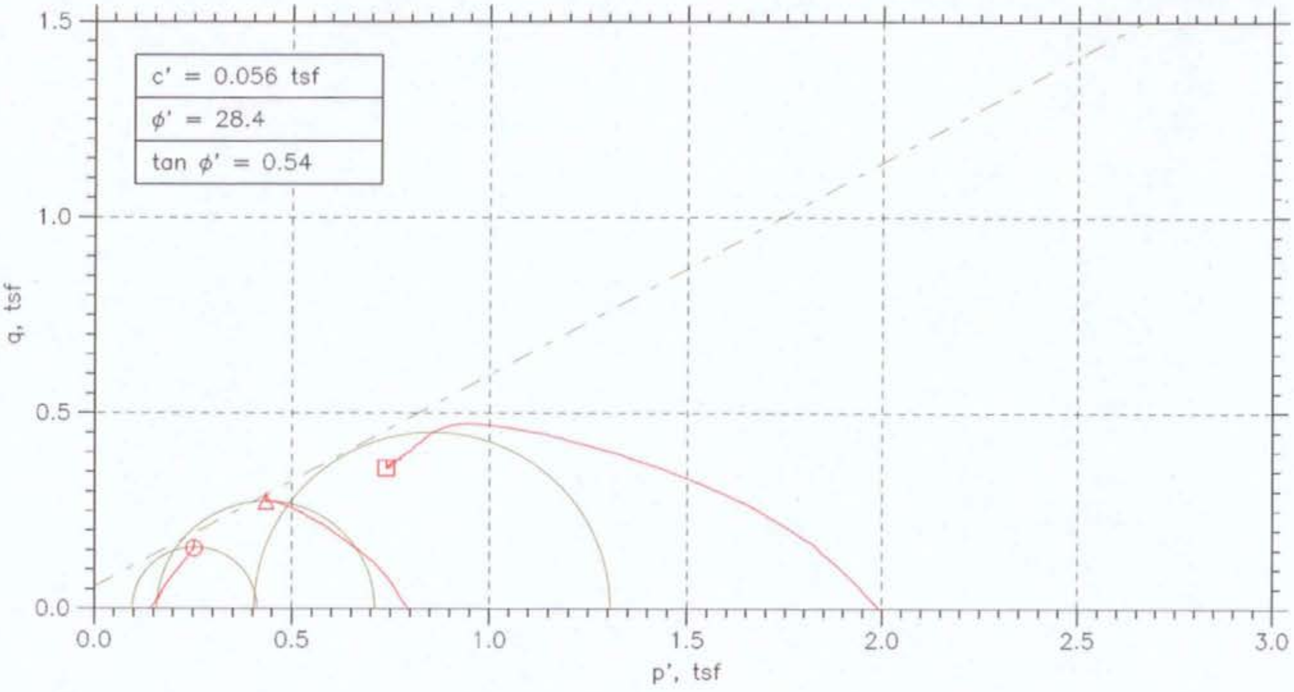
Liquid Limit: 74

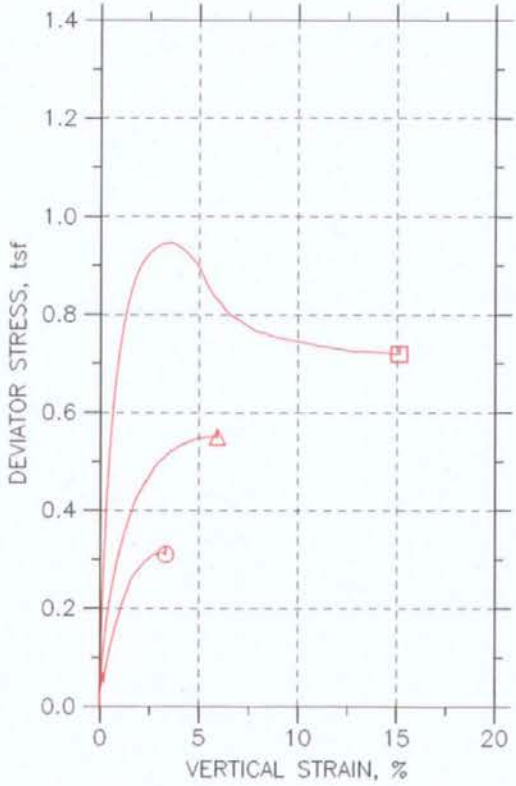
Plastic Limit: 57

Estimated Specific Gravity: 2.99

|  | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 7.0416 | 7.0416 | 0 | 0.000 | 1.9979 | 1.9979 | 1.000 | 1.9979 | 0 |
| 2 | 0.08 | 7.1259 | 7.0416 | 0.44073 | 5.226 | 1.6416 | 1.5572 | 1.054 | 1.5994 | 0.04217 |
| 3 | 0.16 | 7.1909 | 7.0416 | 0.56192 | 3.763 | 1.5853 | 1.436 | 1.104 | 1.5107 | 0.074657 |
| 4 | 0.24 | 7.2451 | 7.0416 | 0.64452 | 3.168 | 1.5569 | 1.3534 | 1.150 | 1.4552 | 0.10173 |
| 5 | 0.31 | 7.2923 | 7.0416 | 0.71027 | 2.833 | 1.5384 | 1.2877 | 1.195 | 1.413 | 0.12537 |
| 6 | 0.39 | 7.3361 | 7.0416 | 0.75375 | 2.559 | 1.5387 | 1.2442 | 1.237 | 1.3915 | 0.14727 |
| 7 | 0.47 | 7.3759 | 7.0416 | 0.80755 | 2.415 | 1.5247 | 1.1904 | 1.281 | 1.3576 | 0.16717 |
| 8 | 0.55 | 7.4134 | 7.0416 | 0.85863 | 2.309 | 1.5111 | 1.1393 | 1.326 | 1.3252 | 0.18592 |
| 9 | 0.63 | 7.4492 | 7.0416 | 0.90102 | 2.211 | 1.5045 | 1.0969 | 1.372 | 1.3007 | 0.20378 |
| 10 | 0.71 | 7.2784 | 7.0416 | 0.82168 | 3.470 | 1.413 | 1.1763 | 1.201 | 1.2947 | 0.11839 |
| 11 | 0.79 | 7.3766 | 7.0416 | 0.89124 | 2.661 | 1.4417 | 1.1067 | 1.303 | 1.2742 | 0.16748 |
| 12 | 0.87 | 7.4476 | 7.0416 | 0.93961 | 2.314 | 1.4644 | 1.0583 | 1.384 | 1.2613 | 0.20301 |
| 13 | 0.94 | 7.4961 | 7.0416 | 0.97765 | 2.151 | 1.4748 | 1.0203 | 1.445 | 1.2476 | 0.22726 |
| 14 | 1.10 | 7.5615 | 7.0416 | 1.0385 | 1.998 | 1.4793 | 0.95943 | 1.542 | 1.2194 | 0.25995 |
| 15 | 1.26 | 7.6116 | 7.0416 | 1.0977 | 1.926 | 1.4702 | 0.9002 | 1.633 | 1.1852 | 0.28499 |
| 16 | 1.42 | 7.6564 | 7.0416 | 1.151 | 1.872 | 1.4618 | 0.84694 | 1.726 | 1.1543 | 0.30741 |
| 17 | 1.58 | 7.6911 | 7.0416 | 1.1803 | 1.817 | 1.4671 | 0.8176 | 1.794 | 1.1424 | 0.32477 |
| 18 | 1.74 | 7.7229 | 7.0416 | 1.2358 | 1.814 | 1.4435 | 0.76217 | 1.894 | 1.1028 | 0.34066 |
| 19 | 1.90 | 7.7491 | 7.0416 | 1.2755 | 1.803 | 1.4299 | 0.72249 | 1.979 | 1.0762 | 0.35373 |
| 20 | 2.06 | 7.774 | 7.0416 | 1.3102 | 1.789 | 1.4201 | 0.68771 | 2.065 | 1.0539 | 0.36619 |
| 21 | 2.22 | 7.7977 | 7.0416 | 1.3341 | 1.765 | 1.4199 | 0.6638 | 2.139 | 1.0418 | 0.37804 |
| 22 | 2.38 | 7.8147 | 7.0416 | 1.3662 | 1.767 | 1.4048 | 0.63174 | 2.224 | 1.0183 | 0.38654 |
| 23 | 2.55 | 7.8349 | 7.0416 | 1.3928 | 1.756 | 1.3984 | 0.60511 | 2.311 | 1.0018 | 0.39666 |
| 24 | 2.71 | 7.8507 | 7.0416 | 1.3983 | 1.728 | 1.4088 | 0.59968 | 2.349 | 1.0042 | 0.40454 |
| 25 | 2.87 | 7.8625 | 7.0416 | 1.4336 | 1.746 | 1.3853 | 0.56435 | 2.455 | 0.97483 | 0.41047 |
| 26 | 3.03 | 7.8738 | 7.0416 | 1.4542 | 1.747 | 1.3759 | 0.5437 | 2.531 | 0.95981 | 0.41611 |
| 27 | 3.19 | 7.8812 | 7.0416 | 1.4553 | 1.733 | 1.3822 | 0.54262 | 2.547 | 0.96242 | 0.4198 |
| 28 | 3.35 | 7.8913 | 7.0416 | 1.483 | 1.745 | 1.3646 | 0.5149 | 2.650 | 0.93974 | 0.42484 |
| [illegible] | 3.51 | 7.8975 | 7.0416 | 1.501 | 1.754 | 1.3529 | 0.49697 | 2.722 | 0.92494 | 0.42797 |
| [illegible] | 3.67 | 7.9043 | 7.0416 | 1.5151 | 1.756 | 1.3455 | 0.48284 | 2.787 | 0.91419 | 0.43135 |
| 31 | 3.84 | 7.9132 | 7.0416 | 1.5151 | 1.738 | 1.3544 | 0.48284 | 2.805 | 0.91864 | 0.4358 |
| 32 | 4.32 | 7.918 | 7.0416 | 1.5401 | 1.757 | 1.3342 | 0.45784 | 2.914 | 0.89603 | 0.43819 |
| 33 | 4.81 | 7.92 | 7.0416 | 1.5684 | 1.785 | 1.308 | 0.42958 | 3.045 | 0.8688 | 0.43922 |
| 34 | 5.29 | 7.9215 | 7.0416 | 1.5847 | 1.801 | 1.2931 | 0.41328 | 3.129 | 0.8532 | 0.43993 |
| 35 | 5.78 | 7.9063 | 7.0416 | 1.5972 | 1.847 | 1.2655 | 0.40078 | 3.158 | 0.83313 | 0.43235 |
| 36 | 6.25 | 7.8966 | 7.0416 | 1.6042 | 1.876 | 1.2487 | 0.39371 | 3.172 | 0.82121 | 0.42749 |
| 37 | 6.74 | 7.8753 | 7.0416 | 1.6194 | 1.943 | 1.2122 | 0.3785 | 3.203 | 0.79533 | 0.41683 |
| 38 | 7.22 | 7.8631 | 7.0416 | 1.6254 | 1.979 | 1.194 | 0.37252 | 3.205 | 0.78325 | 0.41073 |
| 39 | 7.71 | 7.8587 | 7.0416 | 1.6303 | 1.995 | 1.1847 | 0.36763 | 3.223 | 0.77619 | 0.40856 |
| 40 | 8.20 | 7.8482 | 7.0416 | 1.6336 | 2.025 | 1.1709 | 0.36437 | 3.214 | 0.76766 | 0.40329 |
| 41 | 8.68 | 7.8418 | 7.0416 | 1.6379 | 2.047 | 1.1603 | 0.36002 | 3.223 | 0.76015 | 0.40012 |
| 42 | 9.16 | 7.8253 | 7.0416 | 1.6417 | 2.095 | 1.1399 | 0.35622 | 3.200 | 0.74807 | 0.39185 |
| 43 | 9.64 | 7.8232 | 7.0416 | 1.6444 | 2.104 | 1.1351 | 0.3535 | 3.211 | 0.74429 | 0.39079 |
| 44 | 10.13 | 7.8195 | 7.0416 | 1.6472 | 2.118 | 1.1287 | 0.35078 | 3.218 | 0.73972 | 0.38894 |
| 45 | 10.62 | 7.8315 | 7.0416 | 1.6493 | 2.088 | 1.1385 | 0.34861 | 3.266 | 0.74356 | 0.39495 |
| 46 | 11.10 | 7.8191 | 7.0416 | 1.6504 | 2.123 | 1.125 | 0.34752 | 3.237 | 0.73628 | 0.38876 |
| 47 | 11.59 | 7.8234 | 7.0416 | 1.6521 | 2.113 | 1.1277 | 0.34589 | 3.260 | 0.73681 | 0.39091 |
| 48 | 12.07 | 7.8162 | 7.0416 | 1.6521 | 2.133 | 1.1205 | 0.34589 | 3.239 | 0.73319 | 0.38729 |
| 49 | 12.55 | 7.8119 | 7.0416 | 1.6526 | 2.145 | 1.1157 | 0.34535 | 3.231 | 0.73052 | 0.38517 |
| 50 | 13.04 | 7.7874 | 7.0416 | 1.6504 | 2.213 | 1.0934 | 0.34752 | 3.146 | 0.72044 | 0.37291 |
| 51 | 13.52 | 7.7828 | 7.0416 | 1.651 | 2.227 | 1.0882 | 0.34698 | 3.136 | 0.71757 | 0.37059 |
| 52 | 14.01 | 7.7815 | 7.0416 | 1.651 | 2.231 | 1.0869 | 0.34698 | 3.133 | 0.71695 | 0.36997 |
| 53 | 14.47 | 7.7814 | 7.0416 | 1.651 | 2.231 | 1.0868 | 0.34698 | 3.132 | 0.7169 | 0.36992 |

# TRIAXIAL COMPRESSION TEST REPORT





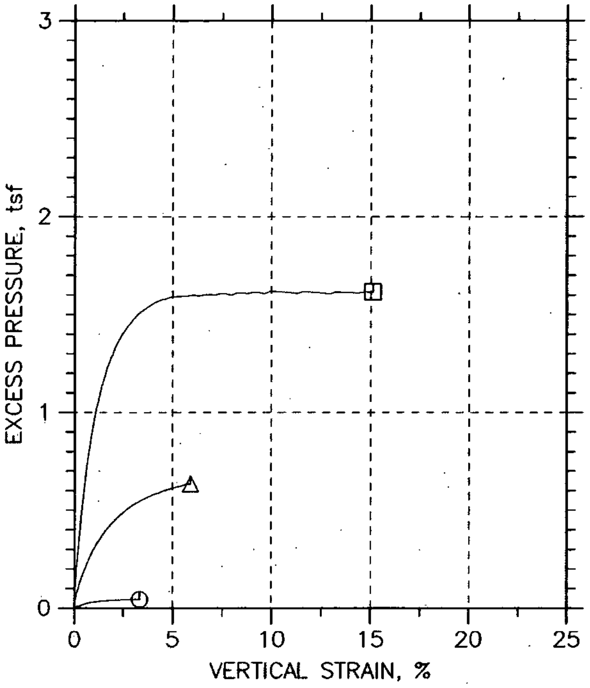
| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ○ | △ | □ | |
| Test No. | | 2.0 PSI | 11.1 PSI | 27.8 PSI | |
| Initial | Diameter, in | 2.8039 | 2.8524 | 2.9409 | |
| | Height, in | 5.9799 | 5.687 | 5.0587 | |
| | Water Content, % | 281.71 | 242.45 | 215.32 | |
| | Dry Density, pcf | 19.07 | 21.6 | 24.81 | |
| | Saturation, % | 95.84 | 94.85 | 98.65 | |
| | Void Ratio | 8.8122 | 7.6635 | 6.5433 | |
| Before Shear | Water Content, % | 242.35 | 215.32 | 199.42 | |
| | Dry Density, pcf | 22.64 | 25.1 | 26.82 | |
| | Saturation, % | 100.00 | 100.00 | 100.00 | |
| | Void Ratio | 7.2656 | 6.4554 | 5.9787 | |
| | Back Press., tsf | 5.0415 | 5.0432 | 5.0465 | |
| Minor Prin. Stress, tsf | | 0.14249 | 0.79604 | 1.9951 | |
| Max. Dev. Stress, tsf | | 0.3152 | 0.55245 | 0.94771 | |
| Time to Failure, min | | 240 | 420 | 390 | |
| Strain Rate, %/min | | 0.02 | 0.02 | 0.02 | |
| B-Value | | .97 | --- | --- | |
| Measured Specific Gravity | | 3.00 | 3.00 | 3.00 | |
| Liquid Limit | | 67 | 67 | 67 | |
| Plastic Limit | | 62 | 62 | 62 | |
| Plasticity Index | | 5 | 5 | 5 | |
| Failure Sketch | |  |  |  | |

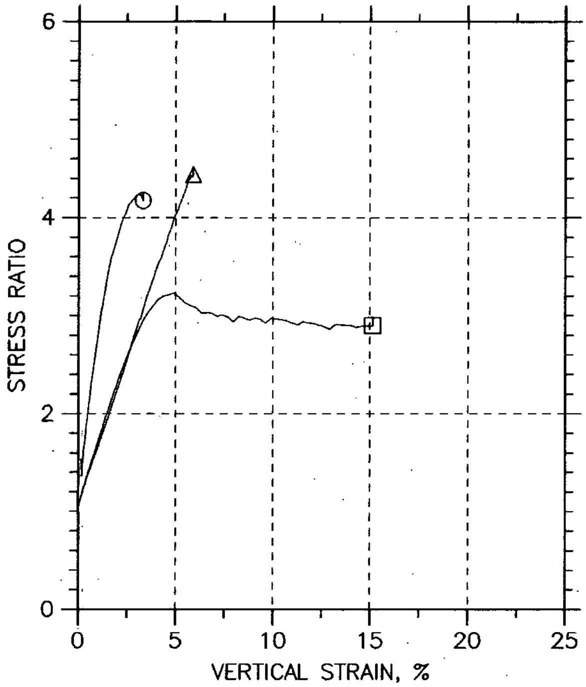
Project: RICO-ARGENTINE SITE OU01
Location: RICO, CO
Project No.: 60157757
[illegible]ring No.: ST18-1
Sample Type: 3" ST
Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

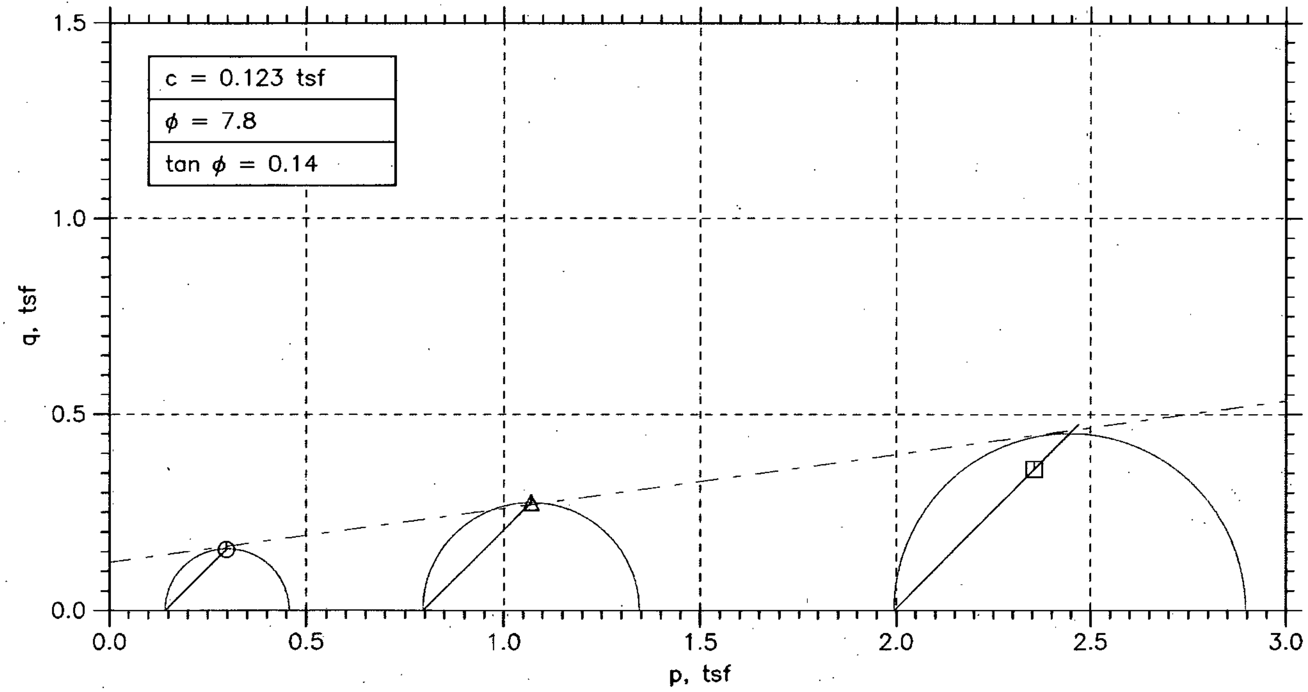
Thu, 03-NOV-2011 16:30:46

# TRIAXIAL COMPRESSION TEST REPORT

**AECOM**







| | | |
|---|---|---|
| Project: RICO-ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST18-1 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-1 | Test Date: 10/26/11 | Depth: 0.0"-30.0" |
| st No.: ST18-1 | Sample Type: 3" ST | Elevation: ---- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN | | |
| Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767. | | |
| | | |

Thu, 03-NOV-2011 14:46:12

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-1
Sample No.: ST18-1
Test No.: 2.0 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/26/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 0.0"-30.0"
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Sp[illegible]en Height: 5.98 in
Specimen Area: 6.17 in^2
Specimen Volume: 605.09 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 67

Plastic Limit: 62

Measured Specific Gravity: 3.00

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.1748 | 0 | 0 | 5.0415 | 5.184 | 5.184 |
| 2 | 2.0041 | 0.022878 | 6.1763 | 2.4651 | 0.028737 | 5.0437 | 5.184 | 5.2127 |
| 3 | 4.0041 | 0.047185 | 6.1778 | 3.1994 | 0.037288 | 5.0459 | 5.184 | 5.2213 |
| 4 | 6.0042 | 0.072922 | 6.1794 | 3.8812 | 0.045223 | 5.0476 | 5.184 | 5.2292 |
| 5 | 8.0042 | 0.09866 | 6.1809 | 4.5106 | 0.052543 | 5.0492 | 5.184 | 5.2365 |
| 6 | 10 | 0.12583 | 6.1826 | 5.0876 | 0.059247 | 5.0509 | 5.184 | 5.2432 |
| 7 | 12 | 0.15013 | 6.1841 | 5.5596 | 0.064729 | 5.052 | 5.184 | 5.2487 |
| 8 | 14 | 0.17587 | 6.1857 | 6.0316 | 0.070207 | 5.0531 | 5.184 | 5.2542 |
| 9 | 16 | 0.20447 | 6.1875 | 4.4057 | 0.051267 | 5.0454 | 5.184 | 5.2353 |
| 10 | 18 | 0.23021 | 6.1891 | 5.14 | 0.059796 | 5.0487 | 5.184 | 5.2438 |
| 11 | 20 | 0.25594 | 6.1907 | 5.717 | 0.06649 | 5.0509 | 5.184 | 5.2505 |
| 12 | 22 | 0.28311 | 6.1924 | 6.3988 | 0.0744 | 5.0525 | 5.184 | 5.2584 |
| 13 | 24 | 0.30885 | 6.194 | 6.9233 | 0.080478 | 5.0542 | 5.184 | 5.2645 |
| 14 | 26 | 0.33459 | 6.1956 | 7.3429 | 0.085333 | 5.0558 | 5.184 | 5.2693 |
| 15 | 28 | 0.35889 | 6.1971 | 7.8149 | 0.090796 | 5.0569 | 5.184 | 5.2748 |
| 16 | 30 | 0.38606 | 6.1988 | 8.0247 | 0.093209 | 5.058 | 5.184 | 5.2772 |
| 17 | 35 | 0.44897 | 6.2027 | 9.3359 | 0.10837 | 5.0608 | 5.184 | 5.2924 |
| 18 | 40 | 0.51332 | 6.2067 | 10.28 | 0.11925 | 5.0624 | 5.184 | 5.3033 |
| 19 | 45 | 0.57909 | 6.2108 | 11.329 | 0.13133 | 5.0646 | 5.184 | 5.3153 |
| 20 | 50 | 0.64343 | 6.2148 | 12.221 | 0.14158 | 5.0663 | 5.184 | 5.3256 |
| 21 | 55 | 0.71064 | 6.219 | 13.217 | 0.15302 | 5.0679 | 5.184 | 5.337 |
| 22 | 60 | 0.77498 | 6.2231 | 14.056 | 0.16263 | 5.069 | 5.184 | 5.3466 |
| 23 | 65 | 0.83932 | 6.2271 | 14.843 | 0.17162 | 5.0707 | 5.184 | 5.3556 |
| 24 | 70.001 | 0.9051 | 6.2312 | 15.577 | 0.17999 | 5.0718 | 5.184 | 5.364 |
| 25 | 75.001 | 0.97087 | 6.2354 | 16.364 | 0.18896 | 5.0723 | 5.184 | 5.373 |
| 26 | 80.001 | 1.0366 | 6.2395 | 17.151 | 0.19791 | 5.0734 | 5.184 | 5.3819 |
| 27 | 85.001 | 1.1024 | 6.2437 | 18.042 | 0.20806 | 5.074 | 5.184 | 5.3921 |
| 28 | 90.001 | 1.1682 | 6.2478 | 18.829 | 0.21699 | 5.0751 | 5.184 | 5.401 |
| 29 | 100 | 1.3012 | 6.2563 | 19.931 | 0.22937 | 5.0767 | 5.184 | 5.4134 |
| [illegible] | 110 | 1.4313 | 6.2645 | 21.189 | 0.24354 | 5.0778 | 5.184 | 5.4275 |
| [illegible] | 120 | 1.5614 | 6.2728 | 22.448 | 0.25766 | 5.0789 | 5.184 | 5.4417 |
| [illegible] | 130 | 1.6915 | 6.2811 | 23.34 | 0.26754 | 5.08 | 5.184 | 5.4515 |
| 33 | 140 | 1.8202 | 6.2893 | 23.864 | 0.2732 | 5.0811 | 5.184 | 5.4572 |
| 34 | 150 | 1.9489 | 6.2976 | 24.494 | 0.28004 | 5.0817 | 5.184 | 5.464 |
| 35 | 160 | 2.079 | 6.306 | 25.123 | 0.28685 | 5.0828 | 5.184 | 5.4709 |
| 36 | 170 | 2.2077 | 6.3142 | 25.7 | 0.29305 | 5.0839 | 5.184 | 5.4771 |
| 37 | 180 | 2.3392 | 6.3228 | 26.225 | 0.29863 | 5.0844 | 5.184 | 5.4826 |
| 38 | 190 | 2.4665 | 6.331 | 26.539 | 0.30182 | 5.085 | 5.184 | 5.4858 |
| 39 | 200 | 2.5995 | 6.3396 | 27.116 | 0.30796 | 5.0855 | 5.184 | 5.492 |
| 40 | 210 | 2.7282 | 6.348 | 27.274 | 0.30934 | 5.0861 | 5.184 | 5.4933 |
| 41 | 220 | 2.8583 | 6.3565 | 27.588 | 0.31249 | 5.0861 | 5.184 | 5.4965 |
| 42 | 230 | 2.9884 | 6.3651 | 27.746 | 0.31385 | 5.0866 | 5.184 | 5.4979 |
| 43 | 240 | 3.1214 | 6.3738 | 27.903 | 0.3152 | 5.0866 | 5.184 | 5.4992 |
| 44 | 250 | 3.2515 | 6.3824 | 27.85 | 0.31418 | 5.0866 | 5.184 | 5.4982 |
| 45 | 257.36 | 3.3473 | 6.3887 | 27.588 | 0.31092 | 5.0861 | 5.184 | 5.4949 |

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-1
Sample No.: ST18-1
Test No.: 2.0 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/26/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 0.0"-30.0"
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 5.98 in
Specimen Area: 6.17 in^2
Specimen Volume: 605.09 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 67

Plastic Limit: 62

Measured Specific Gravity: 3.00

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.184 | 5.184 | 0 | 0.000 | 0.14249 | 0.14249 | 1.000 | 0.14249 | 0 |
| 2 | 0.02 | 5.2127 | 5.184 | 0.0022006 | 0.077 | 0.16903 | 0.14029 | 1.205 | 0.15466 | 0.014369 |
| 3 | 0.05 | 5.2213 | 5.184 | 0.0044011 | 0.118 | 0.17538 | 0.13809 | 1.270 | 0.15674 | 0.018644 |
| 4 | 0.07 | 5.2292 | 5.184 | 0.0060516 | 0.134 | 0.18166 | 0.13644 | 1.331 | 0.15905 | 0.022611 |
| 5 | 0.10 | 5.2365 | 5.184 | 0.007702 | 0.147 | 0.18733 | 0.13479 | 1.390 | 0.16106 | 0.026271 |
| 6 | 0.13 | 5.2432 | 5.184 | 0.0093524 | 0.158 | 0.19239 | 0.13314 | 1.445 | 0.16276 | 0.029624 |
| 7 | 0.15 | 5.2487 | 5.184 | 0.010453 | 0.161 | 0.19677 | 0.13204 | 1.490 | 0.1644 | 0.032364 |
| 8 | 0.18 | 5.2542 | 5.184 | 0.011553 | 0.165 | 0.20115 | 0.13094 | 1.536 | 0.16604 | 0.035103 |
| 9 | 0.20 | 5.2353 | 5.184 | 0.003851 | 0.075 | 0.18991 | 0.13864 | 1.370 | 0.16428 | 0.025633 |
| 10 | 0.23 | 5.2438 | 5.184 | 0.0071519 | 0.120 | 0.19514 | 0.13534 | 1.442 | 0.16524 | 0.029898 |
| 11 | 0.26 | 5.2505 | 5.184 | 0.0093524 | 0.141 | 0.19963 | 0.13314 | 1.499 | 0.16639 | 0.033245 |
| 12 | 0.28 | 5.2584 | 5.184 | 0.011003 | 0.148 | 0.20589 | 0.13149 | 1.566 | 0.16869 | 0.0372 |
| 13 | 0.31 | 5.2645 | 5.184 | 0.012653 | 0.157 | 0.21032 | 0.12984 | 1.620 | 0.17008 | 0.040239 |
| 14 | 0.33 | 5.2693 | 5.184 | 0.014304 | 0.168 | 0.21352 | 0.12819 | 1.666 | 0.17086 | 0.042666 |
| 15 | 0.36 | 5.2748 | 5.184 | 0.015404 | 0.170 | 0.21789 | 0.12709 | 1.714 | 0.17249 | 0.045398 |
| 16 | 0.39 | 5.2772 | 5.184 | 0.016504 | 0.177 | 0.2192 | 0.12599 | 1.740 | 0.17259 | 0.046604 |
| 17 | 0.45 | 5.2924 | 5.184 | 0.019255 | 0.178 | 0.23161 | 0.12324 | 1.879 | 0.17742 | 0.054185 |
| 18 | 0.51 | 5.3033 | 5.184 | 0.020905 | 0.175 | 0.24084 | 0.12159 | 1.981 | 0.18121 | 0.059626 |
| 19 | 0.58 | 5.3153 | 5.184 | 0.023106 | 0.176 | 0.25072 | 0.11939 | 2.100 | 0.18505 | 0.065667 |
| 20 | 0.64 | 5.3256 | 5.184 | 0.024756 | 0.175 | 0.25931 | 0.11774 | 2.203 | 0.18853 | 0.070789 |
| 21 | 0.71 | 5.337 | 5.184 | 0.026407 | 0.173 | 0.26911 | 0.11609 | 2.318 | 0.1926 | 0.07651 |
| 22 | 0.77 | 5.3466 | 5.184 | 0.027507 | 0.169 | 0.27762 | 0.11499 | 2.414 | 0.1963 | 0.081315 |
| 23 | 0.84 | 5.3556 | 5.184 | 0.029158 | 0.170 | 0.28496 | 0.11334 | 2.514 | 0.19915 | 0.08581 |
| 24 | 0.91 | 5.364 | 5.184 | 0.030258 | 0.168 | 0.29223 | 0.11224 | 2.604 | 0.20223 | 0.089996 |
| 25 | 0.97 | 5.373 | 5.184 | 0.030808 | 0.163 | 0.30064 | 0.11168 | 2.692 | 0.20616 | 0.094478 |
| 26 | 1.04 | 5.3819 | 5.184 | 0.031908 | 0.161 | 0.30849 | 0.11058 | 2.790 | 0.20954 | 0.098955 |
| 27 | 1.10 | 5.3921 | 5.184 | 0.032458 | 0.156 | 0.31809 | 0.11003 | 2.891 | 0.21406 | 0.10403 |
| 28 | 1.17 | 5.401 | 5.184 | 0.033559 | 0.155 | 0.32592 | 0.10893 | 2.992 | 0.21743 | 0.10849 |
| [illegible] | 1.30 | 5.4134 | 5.184 | 0.035209 | 0.154 | 0.33666 | 0.10728 | 3.138 | 0.22197 | 0.11469 |
| [illegible] | 1.43 | 5.4275 | 5.184 | 0.036309 | 0.149 | 0.34972 | 0.10618 | 3.294 | 0.22795 | 0.12177 |
| 31 | 1.56 | 5.4417 | 5.184 | 0.03741 | 0.145 | 0.36275 | 0.10508 | 3.452 | 0.23392 | 0.12883 |
| 32 | 1.69 | 5.4515 | 5.184 | 0.03851 | 0.144 | 0.37153 | 0.10398 | 3.573 | 0.23775 | 0.13377 |
| 33 | 1.82 | 5.4572 | 5.184 | 0.03961 | 0.145 | 0.37608 | 0.10288 | 3.655 | 0.23948 | 0.1366 |
| 34 | 1.95 | 5.464 | 5.184 | 0.04016 | 0.143 | 0.38237 | 0.10233 | 3.737 | 0.24235 | 0.14002 |
| 35 | 2.08 | 5.4709 | 5.184 | 0.041261 | 0.144 | 0.38808 | 0.10123 | 3.834 | 0.24466 | 0.14343 |
| 36 | 2.21 | 5.4771 | 5.184 | 0.042361 | 0.145 | 0.39318 | 0.10013 | 3.927 | 0.24666 | 0.14653 |
| 37 | 2.34 | 5.4826 | 5.184 | 0.042911 | 0.144 | 0.39821 | 0.099582 | 3.999 | 0.2489 | 0.14932 |
| 38 | 2.47 | 5.4858 | 5.184 | 0.043461 | 0.144 | 0.40085 | 0.099032 | 4.048 | 0.24994 | 0.15091 |
| 39 | 2.60 | 5.492 | 5.184 | 0.044011 | 0.143 | 0.40644 | 0.098481 | 4.127 | 0.25246 | 0.15398 |
| 40 | 2.73 | 5.4933 | 5.184 | 0.044562 | 0.144 | 0.40727 | 0.097931 | 4.159 | 0.2526 | 0.15467 |
| 41 | 2.86 | 5.4965 | 5.184 | 0.044562 | 0.143 | 0.41042 | 0.097931 | 4.191 | 0.25418 | 0.15624 |
| 42 | 2.99 | 5.4979 | 5.184 | 0.045112 | 0.144 | 0.41123 | 0.097381 | 4.223 | 0.25431 | 0.15693 |
| 43 | 3.12 | 5.4992 | 5.184 | 0.045112 | 0.143 | 0.41258 | 0.097381 | 4.237 | 0.25498 | 0.1576 |
| 44 | 3.25 | 5.4982 | 5.184 | 0.045112 | 0.144 | 0.41156 | 0.097381 | 4.226 | 0.25447 | 0.15709 |
| 45 | 3.35 | 5.4949 | 5.184 | 0.044562 | 0.143 | 0.40885 | 0.097931 | 4.175 | 0.25339 | 0.15546 |

## TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-1
Sample No.: 11.1 PSI
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/27/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 0.0"-30.0"
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Re[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767.

Sp[illegible]en Height: 5.69 in
Specimen Area: 6.39 in^2
Specimen Volume: 595.50 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 67

Plastic Limit: 62

Measured Specific Gravity: 3.00

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.39 | 0 | 0 | 5.0432 | 5.8392 | 5.8392 |
| 2 | 2 | 0.022552 | 6.3914 | 2.7616 | 0.03111 | 5.069 | 5.8392 | 5.8703 |
| 3 | 4 | 0.046608 | 6.393 | 4.1666 | 0.046926 | 5.0833 | 5.8392 | 5.8861 |
| 4 | 6 | 0.073671 | 6.3947 | 5.5232 | 0.062188 | 5.0954 | 5.8392 | 5.9014 |
| 5 | 8.0001 | 0.097727 | 6.3962 | 6.686 | 0.075262 | 5.1064 | 5.8392 | 5.9145 |
| 6 | 10 | 0.12329 | 6.3979 | 7.8972 | 0.088873 | 5.1163 | 5.8392 | 5.9281 |
| 7 | 12 | 0.15035 | 6.3996 | 8.9631 | 0.10084 | 5.1257 | 5.8392 | 5.94 |
| 8 | 14 | 0.17441 | 6.4011 | 9.9805 | 0.11226 | 5.135 | 5.8392 | 5.9515 |
| 9 | 16 | 0.19996 | 6.4028 | 10.949 | 0.12313 | 5.1438 | 5.8392 | 5.9623 |
| 10 | 18 | 0.22703 | 6.4045 | 11.918 | 0.13399 | 5.1526 | 5.8392 | 5.9732 |
| 11 | 20 | 0.25259 | 6.4062 | 12.742 | 0.14321 | 5.1614 | 5.8392 | 5.9824 |
| 12 | 22 | 0.27815 | 6.4078 | 13.614 | 0.15297 | 5.1697 | 5.8392 | 5.9922 |
| 13 | 24 | 0.30521 | 6.4095 | 14.486 | 0.16273 | 5.1774 | 5.8392 | 6.0019 |
| 14 | 26 | 0.33077 | 6.4112 | 15.213 | 0.17085 | 5.1851 | 5.8392 | 6.01 |
| 15 | 28 | 0.35783 | 6.4129 | 15.94 | 0.17896 | 5.1928 | 5.8392 | 6.0182 |
| 16 | 30 | 0.38489 | 6.4147 | 16.715 | 0.18761 | 5.201 | 5.8392 | 6.0268 |
| 17 | 35 | 0.44955 | 6.4188 | 18.459 | 0.20706 | 5.2192 | 5.8392 | 6.0463 |
| 18 | 40 | 0.51871 | 6.4233 | 19.961 | 0.22375 | 5.2363 | 5.8392 | 6.0629 |
| 19 | 45 | 0.58636 | 6.4277 | 21.318 | 0.23879 | 5.25 | 5.8392 | 6.078 |
| 20 | 50 | 0.65252 | 6.4319 | 22.674 | 0.25382 | 5.2676 | 5.8392 | 6.093 |
| 21 | 55 | 0.72017 | 6.4363 | 23.934 | 0.26774 | 5.283 | 5.8392 | 6.1069 |
| 22 | 60 | 0.78783 | 6.4407 | 25.194 | 0.28164 | 5.2984 | 5.8392 | 6.1208 |
| 23 | 65.001 | 0.85549 | 6.4451 | 26.405 | 0.29497 | 5.3127 | 5.8392 | 6.1342 |
| 24 | 70.001 | 0.92164 | 6.4494 | 27.471 | 0.30668 | 5.3265 | 5.8392 | 6.1459 |
| 25 | 75.001 | 0.9893 | 6.4538 | 28.391 | 0.31674 | 5.3397 | 5.8392 | 6.1559 |
| 26 | 80.001 | 1.057 | 6.4582 | 29.36 | 0.32732 | 5.3523 | 5.8392 | 6.1665 |
| 27 | 85 | 1.1246 | 6.4627 | 30.378 | 0.33843 | 5.3644 | 5.8392 | 6.1776 |
| 28 | 90 | 1.1923 | 6.4671 | 31.298 | 0.34845 | 5.376 | 5.8392 | 6.1877 |
| 29 | 95.001 | 1.2614 | 6.4716 | 32.122 | 0.35737 | 5.387 | 5.8392 | 6.1966 |
| [illegible] | 100 | 1.3276 | 6.4759 | 32.897 | 0.36575 | 5.398 | 5.8392 | 6.205 |
| [illegible] | 105 | 1.3967 | 6.4805 | 33.721 | 0.37464 | 5.4085 | 5.8392 | 6.2138 |
| 32 | 110 | 1.4674 | 6.4851 | 34.447 | 0.38244 | 5.4184 | 5.8392 | 6.2216 |
| 33 | 115 | 1.5351 | 6.4896 | 35.222 | 0.39078 | 5.4283 | 5.8392 | 6.23 |
| 34 | 120 | 1.6042 | 6.4942 | 35.998 | 0.3991 | 5.4376 | 5.8392 | 6.2383 |
| 35 | 125 | 1.6719 | 6.4986 | 36.724 | 0.40688 | 5.4464 | 5.8392 | 6.2461 |
| 36 | 130 | 1.741 | 6.5032 | 37.5 | 0.41518 | 5.4552 | 5.8392 | 6.2544 |
| 37 | 135 | 1.8117 | 6.5079 | 38.033 | 0.42077 | 5.4635 | 5.8392 | 6.26 |
| 38 | 140 | 1.8809 | 6.5125 | 38.711 | 0.42798 | 5.4717 | 5.8392 | 6.2672 |
| 39 | 145 | 1.95 | 6.5171 | 39.244 | 0.43356 | 5.4789 | 5.8392 | 6.2728 |
| 40 | 150 | 2.0162 | 6.5215 | 39.777 | 0.43915 | 5.4849 | 5.8392 | 6.2784 |
| 41 | 155 | 2.0838 | 6.526 | 40.067 | 0.44206 | 5.4926 | 5.8392 | 6.2813 |
| 42 | 160 | 2.153 | 6.5306 | 40.649 | 0.44816 | 5.4998 | 5.8392 | 6.2874 |
| 43 | 165 | 2.2207 | 6.5351 | 41.182 | 0.45372 | 5.5069 | 5.8392 | 6.2929 |
| 44 | 170 | 2.2883 | 6.5396 | 41.521 | 0.45714 | 5.513 | 5.8392 | 6.2963 |
| 45 | 175 | 2.356 | 6.5442 | 41.957 | 0.46162 | 5.5196 | 5.8392 | 6.3008 |
| 46 | 180 | 2.4236 | 6.5487 | 42.441 | 0.46662 | 5.5262 | 5.8392 | 6.3058 |
| 47 | 185 | 2.4913 | 6.5532 | 42.781 | 0.47003 | 5.5317 | 5.8392 | 6.3092 |
| 48 | 190 | 2.559 | 6.5578 | 43.168 | 0.47396 | 5.5377 | 5.8392 | 6.3132 |
| 49 | 195 | 2.6251 | 6.5622 | 43.701 | 0.47948 | 5.5432 | 5.8392 | 6.3187 |
| 50 | 200 | 2.6913 | 6.5667 | 44.04 | 0.48288 | 5.5487 | 5.8392 | 6.3221 |
| 51 | 205 | 2.7589 | 6.5713 | 44.573 | 0.48838 | 5.5537 | 5.8392 | 6.3276 |
| 52 | 210 | 2.8251 | 6.5757 | 44.912 | 0.49176 | 5.5586 | 5.8392 | 6.331 |
| 53 | 215 | 2.8912 | 6.5802 | 45.3 | 0.49567 | 5.563 | 5.8392 | 6.3349 |
| 54 | 220 | 2.9604 | 6.5849 | 45.494 | 0.49743 | 5.568 | 5.8392 | 6.3366 |
| 55 | 225 | 3.028 | 6.5895 | 45.833 | 0.50079 | 5.5724 | 5.8392 | 6.34 |
| 56 | 230 | 3.0957 | 6.5941 | 46.124 | 0.50362 | 5.5768 | 5.8392 | 6.3428 |
| 57 | 235 | 3.1634 | 6.5987 | 46.366 | 0.50591 | 5.5812 | 5.8392 | 6.3451 |
| 58 | 240 | 3.2325 | 6.6034 | 46.511 | 0.50713 | 5.5823 | 5.8392 | 6.3463 |
| 59 | 245 | 3.3002 | 6.6081 | 46.802 | 0.50994 | 5.5872 | 5.8392 | 6.3491 |
| 60 | 250 | 3.3678 | 6.6127 | 47.189 | 0.51381 | 5.5916 | 5.8392 | 6.353 |
| 61 | 255 | 3.4355 | 6.6173 | 47.432 | 0.51608 | 5.5955 | 5.8392 | 6.3553 |
| 62 | 260 | 3.5031 | 6.622 | 47.722 | 0.51888 | 5.5994 | 5.8392 | 6.3581 |
| 63 | 265 | 3.5708 | 6.6266 | 48.013 | 0.52168 | 5.6027 | 5.8392 | 6.3609 |
| 64 | 270 | 3.64 | 6.6314 | 48.158 | 0.52288 | 5.606 | 5.8392 | 6.3621 |
| 65 | 275 | 3.7091 | 6.6361 | 48.255 | 0.52356 | 5.6093 | 5.8392 | 6.3628 |
| 66 | 280 | 3.7783 | 6.6409 | 48.546 | 0.52633 | 5.6126 | 5.8392 | 6.3655 |
| 67 | 285 | 3.8474 | 6.6457 | 48.691 | 0.52753 | 5.6153 | 5.8392 | 6.3667 |
| 68 | 290 | 3.9151 | 6.6503 | 48.837 | 0.52873 | 5.6181 | 5.8392 | 6.3679 |
| 69 | 295 | 3.9858 | 6.6552 | 49.176 | 0.53201 | 5.6219 | 5.8392 | 6.3712 |
| 70 | 300 | 4.0549 | 6.66 | 49.321 | 0.5332 | 5.6247 | 5.8392 | 6.3724 |
| [illegible] | 305 | 4.1241 | 6.6648 | 49.467 | 0.53438 | 5.6274 | 5.8392 | 6.3736 |
| [illegible] | 310 | 4.1948 | 6.6698 | 49.66 | 0.53608 | 5.6296 | 5.8392 | 6.3753 |
| 73 | 315 | 4.2624 | 6.6745 | 49.854 | 0.5378 | 5.6307 | 5.8392 | 6.377 |
| 74 | 320 | 4.3301 | 6.6792 | 49.903 | 0.53794 | 5.6335 | 5.8392 | 6.3771 |
| 75 | 325 | 4.3992 | 6.684 | 50.096 | 0.53964 | 5.6362 | 5.8392 | 6.3788 |
| 76 | 330 | 4.4669 | 6.6888 | 50.29 | 0.54134 | 5.639 | 5.8392 | 6.3805 |
| 77 | 335 | 4.536 | 6.6936 | 50.29 | 0.54095 | 5.6417 | 5.8392 | 6.3801 |
| 78 | 340 | 4.6052 | 6.6985 | 50.484 | 0.54264 | 5.6439 | 5.8392 | 6.3818 |
| 79 | 345 | 4.6714 | 6.7031 | 50.726 | 0.54487 | 5.6467 | 5.8392 | 6.3841 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 80 | 350 | 4.739 | 6.7079 | 50.775 | 0.545 | 5.6489 | 5.8392 | 6.3842 |
| 81 | 355 | 4.8082 | 6.7127 | 50.872 | 0.54564 | 5.6511 | 5.8392 | 6.3848 |
| 82 | 360 | 4.8773 | 6.7176 | 51.065 | 0.54732 | 5.6533 | 5.8392 | 6.3865 |
| 83 | 365 | 4.9435 | 6.7223 | 51.211 | 0.5485 | 5.6555 | 5.8392 | 6.3877 |
| 84 | 370 | 5.0112 | 6.7271 | 51.308 | 0.54915 | 5.6577 | 5.8392 | 6.3883 |
| 85 | 375 | 5.0803 | 6.732 | 51.356 | 0.54926 | 5.6593 | 5.8392 | 6.3885 |
| 86 | 380 | 5.1465 | 6.7367 | 51.356 | 0.54888 | 5.661 | 5.8392 | 6.3881 |
| 87 | 385 | 5.2141 | 6.7415 | 51.55 | 0.55056 | 5.6632 | 5.8392 | 6.3898 |
| [illegible] | 390 | 5.2803 | 6.7462 | 51.55 | 0.55018 | 5.6648 | 5.8392 | 6.3894 |
| [illegible] | 395 | 5.3479 | 6.751 | 51.647 | 0.55082 | 5.6665 | 5.8392 | 6.39 |
| [illegible] | 400 | 5.4171 | 6.756 | 51.744 | 0.55145 | 5.6681 | 5.8392 | 6.3906 |
| 91 | 405 | 5.4832 | 6.7607 | 51.695 | 0.55054 | 5.6703 | 5.8392 | 6.3897 |
| 92 | 410 | 5.5509 | 6.7655 | 51.744 | 0.55067 | 5.672 | 5.8392 | 6.3899 |
| 93 | 415 | 5.6201 | 6.7705 | 51.889 | 0.55181 | 5.6742 | 5.8392 | 6.391 |
| 94 | 420 | 5.6862 | 6.7752 | 51.986 | 0.55245 | 5.6758 | 5.8392 | 6.3917 |
| 95 | 425 | 5.7554 | 6.7802 | 51.937 | 0.55153 | 5.6769 | 5.8392 | 6.3907 |
| 96 | 430 | 5.8245 | 6.7852 | 51.937 | 0.55113 | 5.6786 | 5.8392 | 6.3903 |
| 97 | 435 | 5.8937 | 6.7902 | 51.986 | 0.55124 | 5.678 | 5.8392 | 6.3904 |
| 98 | 437.73 | 5.9313 | 6.7929 | 51.937 | 0.5505 | 5.6791 | 5.8392 | 6.3897 |

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-1
Sample No.: 11.1 PSI
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/27/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 0.0"-30.0"
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 5.69 in
Specimen Area: 6.39 in^2
Specimen Volume: 595.50 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 67

Plastic Limit: 62

Measured Specific Gravity: 3.00

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.8392 | 5.8392 | 0 | 0.000 | 0.79604 | 0.79604 | 1.000 | 0.79604 | 0 |
| 2 | 0.02 | 5.8703 | 5.8392 | 0.025857 | 0.831 | 0.8013 | 0.77019 | 1.040 | 0.78574 | 0.015555 |
| 3 | 0.05 | 5.8861 | 5.8392 | 0.04016 | 0.856 | 0.80281 | 0.75588 | 1.062 | 0.77935 | 0.023463 |
| 4 | 0.07 | 5.9014 | 5.8392 | 0.052264 | 0.840 | 0.80597 | 0.74378 | 1.084 | 0.77487 | 0.031094 |
| 5 | 0.10 | 5.9145 | 5.8392 | 0.063266 | 0.841 | 0.80804 | 0.73278 | 1.103 | 0.77041 | 0.037631 |
| 6 | 0.12 | 5.9281 | 5.8392 | 0.073169 | 0.823 | 0.81175 | 0.72287 | 1.123 | 0.76731 | 0.044437 |
| 7 | 0.15 | 5.94 | 5.8392 | 0.082521 | 0.818 | 0.81436 | 0.71352 | 1.141 | 0.76394 | 0.050421 |
| 8 | 0.17 | 5.9515 | 5.8392 | 0.091874 | 0.818 | 0.81643 | 0.70417 | 1.159 | 0.7603 | 0.05613 |
| 9 | 0.20 | 5.9623 | 5.8392 | 0.10068 | 0.818 | 0.81849 | 0.69537 | 1.177 | 0.75693 | 0.061564 |
| 10 | 0.23 | 5.9732 | 5.8392 | 0.10948 | 0.817 | 0.82055 | 0.68656 | 1.195 | 0.75356 | 0.066994 |
| 11 | 0.25 | 5.9824 | 5.8392 | 0.11828 | 0.826 | 0.82097 | 0.67776 | 1.211 | 0.74937 | 0.071605 |
| 12 | 0.28 | 5.9922 | 5.8392 | 0.12653 | 0.827 | 0.82248 | 0.66951 | 1.228 | 0.746 | 0.076487 |
| 13 | 0.31 | 6.0019 | 5.8392 | 0.13423 | 0.825 | 0.82454 | 0.66181 | 1.246 | 0.74317 | 0.081364 |
| 14 | 0.33 | 6.01 | 5.8392 | 0.14194 | 0.831 | 0.82495 | 0.65411 | 1.261 | 0.73953 | 0.085424 |
| 15 | 0.36 | 6.0182 | 5.8392 | 0.14964 | 0.836 | 0.82536 | 0.6464 | 1.277 | 0.73588 | 0.08948 |
| 16 | 0.38 | 6.0268 | 5.8392 | 0.15789 | 0.842 | 0.82576 | 0.63815 | 1.294 | 0.73196 | 0.093807 |
| 17 | 0.45 | 6.0463 | 5.8392 | 0.17605 | 0.850 | 0.82705 | 0.62 | 1.334 | 0.72352 | 0.10353 |
| 18 | 0.52 | 6.0629 | 5.8392 | 0.1931 | 0.863 | 0.82669 | 0.60294 | 1.371 | 0.71482 | 0.11187 |
| 19 | 0.59 | 6.078 | 5.8392 | 0.20685 | 0.866 | 0.82798 | 0.58919 | 1.405 | 0.70858 | 0.1194 |
| 20 | 0.65 | 6.093 | 5.8392 | 0.22446 | 0.884 | 0.8254 | 0.57158 | 1.444 | 0.69849 | 0.12691 |
| 21 | 0.72 | 6.1069 | 5.8392 | 0.23986 | 0.896 | 0.82392 | 0.55618 | 1.481 | 0.69005 | 0.13387 |
| 22 | 0.79 | 6.1208 | 5.8392 | 0.25527 | 0.906 | 0.82241 | 0.54078 | 1.521 | 0.68159 | 0.14082 |
| 23 | 0.86 | 6.1342 | 5.8392 | 0.26957 | 0.914 | 0.82145 | 0.52647 | 1.560 | 0.67396 | 0.14749 |
| 24 | 0.92 | 6.1459 | 5.8392 | 0.28332 | 0.924 | 0.8194 | 0.51272 | 1.598 | 0.66606 | 0.15334 |
| 25 | 0.99 | 6.1559 | 5.8392 | 0.29653 | 0.936 | 0.81625 | 0.49952 | 1.634 | 0.65788 | 0.15837 |
| 26 | 1.06 | 6.1665 | 5.8392 | 0.30918 | 0.945 | 0.81419 | 0.48686 | 1.672 | 0.65052 | 0.16366 |
| 27 | 1.12 | 6.1776 | 5.8392 | 0.32128 | 0.949 | 0.81319 | 0.47476 | 1.713 | 0.64398 | 0.16922 |
| 28 | 1.19 | 6.1877 | 5.8392 | 0.33284 | 0.955 | 0.81166 | 0.46321 | 1.752 | 0.63743 | 0.17423 |
| [illegible] | 1.26 | 6.1966 | 5.8392 | 0.34384 | 0.962 | 0.80957 | 0.4522 | 1.790 | 0.63089 | 0.17869 |
| [illegible] | 1.33 | 6.205 | 5.8392 | 0.35484 | 0.970 | 0.80695 | 0.4412 | 1.829 | 0.62408 | 0.18288 |
| 31 | 1.40 | 6.2138 | 5.8392 | 0.36529 | 0.975 | 0.80539 | 0.43075 | 1.870 | 0.61807 | 0.18732 |
| 32 | 1.47 | 6.2216 | 5.8392 | 0.3752 | 0.981 | 0.80329 | 0.42085 | 1.909 | 0.61207 | 0.19122 |
| 33 | 1.54 | 6.23 | 5.8392 | 0.3851 | 0.985 | 0.80172 | 0.41094 | 1.951 | 0.60633 | 0.19539 |
| 34 | 1.60 | 6.2383 | 5.8392 | 0.39445 | 0.988 | 0.80069 | 0.40159 | 1.994 | 0.60114 | 0.19955 |
| 35 | 1.67 | 6.2461 | 5.8392 | 0.40325 | 0.991 | 0.79967 | 0.39279 | 2.036 | 0.59623 | 0.20344 |
| 36 | 1.74 | 6.2544 | 5.8392 | 0.41206 | 0.992 | 0.79916 | 0.38399 | 2.081 | 0.59157 | 0.20759 |
| 37 | 1.81 | 6.26 | 5.8392 | 0.42031 | 0.999 | 0.79651 | 0.37573 | 2.120 | 0.58612 | 0.21039 |
| 38 | 1.88 | 6.2672 | 5.8392 | 0.42856 | 1.001 | 0.79546 | 0.36748 | 2.165 | 0.58147 | 0.21399 |
| 39 | 1.95 | 6.2728 | 5.8392 | 0.43571 | 1.005 | 0.79389 | 0.36033 | 2.203 | 0.57711 | 0.21678 |
| 40 | 2.02 | 6.2784 | 5.8392 | 0.44176 | 1.006 | 0.79343 | 0.35428 | 2.240 | 0.57385 | 0.21958 |
| 41 | 2.08 | 6.2813 | 5.8392 | 0.44947 | 1.017 | 0.78863 | 0.34658 | 2.276 | 0.5676 | 0.22103 |
| 42 | 2.15 | 6.2874 | 5.8392 | 0.45662 | 1.019 | 0.78758 | 0.33942 | 2.320 | 0.5635 | 0.22408 |
| 43 | 2.22 | 6.2929 | 5.8392 | 0.46377 | 1.022 | 0.78599 | 0.33227 | 2.365 | 0.55913 | 0.22686 |
| 44 | 2.29 | 6.2963 | 5.8392 | 0.46982 | 1.028 | 0.78336 | 0.32622 | 2.401 | 0.55479 | 0.22857 |
| 45 | 2.36 | 6.3008 | 5.8392 | 0.47642 | 1.032 | 0.78124 | 0.31962 | 2.444 | 0.55043 | 0.23081 |
| 46 | 2.42 | 6.3058 | 5.8392 | 0.48303 | 1.035 | 0.77964 | 0.31302 | 2.491 | 0.54633 | 0.23331 |
| 47 | 2.49 | 6.3092 | 5.8392 | 0.48853 | 1.039 | 0.77754 | 0.30752 | 2.528 | 0.54253 | 0.23501 |
| 48 | 2.56 | 6.3132 | 5.8392 | 0.49458 | 1.044 | 0.77542 | 0.30146 | 2.572 | 0.53844 | 0.23698 |
| 49 | 2.63 | 6.3187 | 5.8392 | 0.50008 | 1.043 | 0.77545 | 0.29596 | 2.620 | 0.5357 | 0.23974 |
| 50 | 2.69 | 6.3221 | 5.8392 | 0.50558 | 1.047 | 0.77334 | 0.29046 | 2.662 | 0.5319 | 0.24144 |
| 51 | 2.76 | 6.3276 | 5.8392 | 0.51053 | 1.045 | 0.77389 | 0.28551 | 2.711 | 0.5297 | 0.24419 |
| 52 | 2.83 | 6.331 | 5.8392 | 0.51548 | 1.048 | 0.77232 | 0.28056 | 2.753 | 0.52644 | 0.24588 |
| 53 | 2.89 | 6.3349 | 5.8392 | 0.51988 | 1.049 | 0.77182 | 0.27616 | 2.795 | 0.52399 | 0.24783 |
| 54 | 2.96 | 6.3366 | 5.8392 | 0.52484 | 1.055 | 0.76864 | 0.27121 | 2.834 | 0.51992 | 0.24872 |
| 55 | 3.03 | 6.34 | 5.8392 | 0.52924 | 1.057 | 0.7676 | 0.26681 | 2.877 | 0.5172 | 0.2504 |
| 56 | 3.10 | 6.3428 | 5.8392 | 0.53364 | 1.060 | 0.76602 | 0.2624 | 2.919 | 0.51421 | 0.25181 |
| 57 | 3.16 | 6.3451 | 5.8392 | 0.53804 | 1.064 | 0.76391 | 0.258 | 2.961 | 0.51096 | 0.25295 |
| 58 | 3.23 | 6.3463 | 5.8392 | 0.53914 | 1.063 | 0.76403 | 0.2569 | 2.974 | 0.51047 | 0.25357 |
| 59 | 3.30 | 6.3491 | 5.8392 | 0.54409 | 1.067 | 0.76189 | 0.25195 | 3.024 | 0.50692 | 0.25497 |
| 60 | 3.37 | 6.353 | 5.8392 | 0.54849 | 1.068 | 0.76136 | 0.24755 | 3.076 | 0.50445 | 0.2569 |
| 61 | 3.44 | 6.3553 | 5.8392 | 0.55234 | 1.070 | 0.75978 | 0.2437 | 3.118 | 0.50174 | 0.25804 |
| 62 | 3.50 | 6.3581 | 5.8392 | 0.55619 | 1.072 | 0.75873 | 0.23985 | 3.163 | 0.49929 | 0.25944 |
| 63 | 3.57 | 6.3609 | 5.8392 | 0.5595 | 1.072 | 0.75822 | 0.23655 | 3.205 | 0.49739 | 0.26084 |
| 64 | 3.64 | 6.3621 | 5.8392 | 0.5628 | 1.076 | 0.75613 | 0.23325 | 3.242 | 0.49469 | 0.26144 |
| 65 | 3.71 | 6.3628 | 5.8392 | 0.5661 | 1.081 | 0.7535 | 0.22995 | 3.277 | 0.49172 | 0.26178 |
| 66 | 3.78 | 6.3655 | 5.8392 | 0.5694 | 1.082 | 0.75298 | 0.22664 | 3.322 | 0.48981 | 0.26317 |
| 67 | 3.85 | 6.3667 | 5.8392 | 0.57215 | 1.085 | 0.75142 | 0.22389 | 3.356 | 0.48766 | 0.26376 |
| 68 | 3.92 | 6.3679 | 5.8392 | 0.5749 | 1.087 | 0.74987 | 0.22114 | 3.391 | 0.48551 | 0.26437 |
| 69 | 3.99 | 6.3712 | 5.8392 | 0.57875 | 1.088 | 0.7493 | 0.21729 | 3.448 | 0.4833 | 0.26601 |
| [illegible] | 4.05 | 6.3724 | 5.8392 | 0.5815 | 1.091 | 0.74774 | 0.21454 | 3.485 | 0.48114 | 0.2666 |
| [illegible] | 4.12 | 6.3736 | 5.8392 | 0.58425 | 1.093 | 0.74618 | 0.21179 | 3.523 | 0.47898 | 0.26719 |
| 72 | 4.19 | 6.3753 | 5.8392 | 0.58645 | 1.094 | 0.74567 | 0.20959 | 3.558 | 0.47763 | 0.26804 |
| 73 | 4.26 | 6.377 | 5.8392 | 0.58755 | 1.093 | 0.74629 | 0.20849 | 3.579 | 0.47739 | 0.2689 |
| 74 | 4.33 | 6.3771 | 5.8392 | 0.5903 | 1.097 | 0.74368 | 0.20574 | 3.615 | 0.47471 | 0.26897 |
| 75 | 4.40 | 6.3788 | 5.8392 | 0.59305 | 1.099 | 0.74262 | 0.20299 | 3.658 | 0.47281 | 0.26982 |
| 76 | 4.47 | 6.3805 | 5.8392 | 0.5958 | 1.101 | 0.74158 | 0.20024 | 3.703 | 0.47091 | 0.27067 |
| 77 | 4.54 | 6.3801 | 5.8392 | 0.59856 | 1.106 | 0.73844 | 0.19749 | 3.739 | 0.46796 | 0.27047 |
| 78 | 4.61 | 6.3818 | 5.8392 | 0.60076 | 1.107 | 0.73793 | 0.19529 | 3.779 | 0.46661 | 0.27132 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 4.67 | 6.3841 | 5.8392 | 0.60351 | 1.108 | 0.7374 | 0.19254 | 3.830 | 0.46497 | 0.27243 |
| 80 | 4.74 | 6.3842 | 5.8392 | 0.60571 | 1.111 | 0.73533 | 0.19034 | 3.863 | 0.46283 | 0.2725 |
| 81 | 4.81 | 6.3848 | 5.8392 | 0.60791 | 1.114 | 0.73378 | 0.18813 | 3.900 | 0.46096 | 0.27282 |
| 82 | 4.88 | 6.3865 | 5.8392 | 0.61011 | 1.115 | 0.73326 | 0.18593 | 3.944 | 0.4596 | 0.27366 |
| 83 | 4.94 | 6.3877 | 5.8392 | 0.61231 | 1.116 | 0.73223 | 0.18373 | 3.985 | 0.45798 | 0.27425 |
| 84 | 5.01 | 6.3883 | 5.8392 | 0.61451 | 1.119 | 0.73068 | 0.18153 | 4.025 | 0.45611 | 0.27457 |
| 85 | 5.08 | 6.3885 | 5.8392 | 0.61616 | 1.122 | 0.72915 | 0.17988 | 4.053 | 0.45451 | 0.27463 |
| 86 | 5.15 | 6.3881 | 5.8392 | 0.61781 | 1.126 | 0.72711 | 0.17823 | 4.080 | 0.45267 | 0.27444 |
| [illegible] | 5.21 | 6.3898 | 5.8392 | 0.62001 | 1.126 | 0.72659 | 0.17603 | 4.128 | 0.45131 | 0.27528 |
| [illegible] | 5.28 | 6.3894 | 5.8392 | 0.62166 | 1.130 | 0.72456 | 0.17438 | 4.155 | 0.44947 | 0.27509 |
| [illegible] | 5.35 | 6.39 | 5.8392 | 0.62331 | 1.132 | 0.72355 | 0.17273 | 4.189 | 0.44814 | 0.27541 |
| 90 | 5.42 | 6.3906 | 5.8392 | 0.62496 | 1.133 | 0.72253 | 0.17108 | 4.223 | 0.4468 | 0.27572 |
| 91 | 5.48 | 6.3897 | 5.8392 | 0.62716 | 1.139 | 0.71942 | 0.16888 | 4.260 | 0.44415 | 0.27527 |
| 92 | 5.55 | 6.3899 | 5.8392 | 0.62881 | 1.142 | 0.7179 | 0.16723 | 4.293 | 0.44256 | 0.27533 |
| 93 | 5.62 | 6.391 | 5.8392 | 0.63101 | 1.144 | 0.71684 | 0.16503 | 4.344 | 0.44093 | 0.2759 |
| 94 | 5.69 | 6.3917 | 5.8392 | 0.63266 | 1.145 | 0.71583 | 0.16338 | 4.381 | 0.4396 | 0.27623 |
| 95 | 5.76 | 6.3907 | 5.8392 | 0.63376 | 1.149 | 0.71381 | 0.16228 | 4.399 | 0.43804 | 0.27577 |
| 96 | 5.82 | 6.3903 | 5.8392 | 0.63541 | 1.153 | 0.71175 | 0.16063 | 4.431 | 0.43619 | 0.27556 |
| 97 | 5.89 | 6.3904 | 5.8392 | 0.63486 | 1.152 | 0.71241 | 0.16118 | 4.420 | 0.4368 | 0.27562 |
| 98 | 5.93 | 6.3897 | 5.8392 | 0.63596 | 1.155 | 0.71058 | 0.16008 | 4.439 | 0.43533 | 0.27525 |

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-1
Sample No.: ST18-1
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/31/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 0.0"-30.0"
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 5.06 in
Specimen Area: 6.79 in^2
Specimen Volume: 563.12 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 67

Plastic Limit: 62

Estimated Specific Gravity: 3.00

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.793 | 0 | 0 | 5.0465 | 7.0416 | 7.0416 |
| 2 | 5.004 | 0.028734 | 6.795 | 6.0674 | 0.06429 | 5.1103 | 7.0416 | 7.1059 |
| 3 | 10.004 | 0.07099 | 6.7979 | 12.782 | 0.13538 | 5.1779 | 7.0416 | 7.177 |
| 4 | 15.004 | 0.11325 | 6.8007 | 17.919 | 0.18971 | 5.2352 | 7.0416 | 7.2313 |
| 5 | 20.004 | 0.15381 | 6.8035 | 22.611 | 0.23929 | 5.2858 | 7.0416 | 7.2809 |
| 6 | 25.004 | 0.19607 | 6.8064 | 27.02 | 0.28583 | 5.338 | 7.0416 | 7.3274 |
| 7 | 30.004 | 0.24171 | 6.8095 | 31.227 | 0.33017 | 5.3809 | 7.0416 | 7.3718 |
| 8 | 35.004 | 0.28565 | 6.8125 | 34.988 | 0.36979 | 5.4343 | 7.0416 | 7.4114 |
| 9 | 40.004 | 0.3296 | 6.8155 | 38.467 | 0.40637 | 5.4811 | 7.0416 | 7.448 |
| 10 | 45.004 | 0.37524 | 6.8186 | 41.663 | 0.43993 | 5.5256 | 7.0416 | 7.4815 |
| 11 | 50.004 | 0.42087 | 6.8217 | 44.656 | 0.47132 | 5.5685 | 7.0416 | 7.5129 |
| 12 | 55.004 | 0.46482 | 6.8248 | 47.487 | 0.50098 | 5.6071 | 7.0416 | 7.5426 |
| 13 | 60 | 0.51045 | 6.8279 | 50.157 | 0.5289 | 5.6456 | 7.0416 | 7.5705 |
| 14 | 70 | 0.60173 | 6.8342 | 54.849 | 0.57785 | 5.7231 | 7.0416 | 7.6195 |
| 15 | 80 | 0.68962 | 6.8402 | 58.853 | 0.61949 | 5.7925 | 7.0416 | 7.6611 |
| 16 | 90 | 0.78089 | 6.8465 | 62.453 | 0.65678 | 5.8535 | 7.0416 | 7.6984 |
| 17 | 100 | 0.87386 | 6.8529 | 65.608 | 0.68931 | 5.9135 | 7.0416 | 7.7309 |
| 18 | 110 | 0.96344 | 6.8591 | 68.399 | 0.71799 | 5.9619 | 7.0416 | 7.7596 |
| 19 | 120 | 1.053 | 6.8653 | 70.948 | 0.74406 | 6.0164 | 7.0416 | 7.7857 |
| 20 | 130 | 1.146 | 6.8718 | 73.213 | 0.7671 | 6.0631 | 7.0416 | 7.8087 |
| 21 | 140 | 1.2373 | 6.8781 | 75.316 | 0.78841 | 6.0983 | 7.0416 | 7.83 |
| 22 | 150 | 1.3285 | 6.8845 | 77.136 | 0.80671 | 6.1445 | 7.0416 | 7.8483 |
| 23 | 160 | 1.4215 | 6.891 | 78.754 | 0.82286 | 6.1814 | 7.0416 | 7.8645 |
| 24 | 170 | 1.5162 | 6.8976 | 80.211 | 0.83727 | 6.2117 | 7.0416 | 7.8789 |
| 25 | 180 | 1.6091 | 6.9041 | 81.545 | 0.8504 | 6.2463 | 7.0416 | 7.892 |
| 26 | 190 | 1.7021 | 6.9107 | 82.799 | 0.86266 | 6.276 | 7.0416 | 7.9043 |
| 27 | 200 | 1.7934 | 6.9171 | 84.134 | 0.87575 | 6.3002 | 7.0416 | 7.9174 |
| 28 | 210 | 1.8863 | 6.9236 | 85.145 | 0.88544 | 6.3272 | 7.0416 | 7.927 |
| 29 | 220 | 1.981 | 6.9303 | 86.035 | 0.89383 | 6.3437 | 7.0416 | 7.9354 |
| [illegible] | 230 | 2.0739 | 6.9369 | 86.804 | 0.90096 | 6.3712 | 7.0416 | 7.9426 |
| [illegible] | 240 | 2.1669 | 6.9435 | 87.532 | 0.90765 | 6.3927 | 7.0416 | 7.9493 |
| 32 | 270 | 2.4458 | 6.9633 | 89.271 | 0.92305 | 6.4449 | 7.0416 | 7.9647 |
| 33 | 300 | 2.7298 | 6.9837 | 90.606 | 0.93413 | 6.4856 | 7.0416 | 7.9757 |
| 34 | 330 | 3.0002 | 7.0031 | 91.577 | 0.94151 | 6.5186 | 7.0416 | 7.9831 |
| 35 | 360 | 3.2757 | 7.0231 | 92.305 | 0.9463 | 6.55 | 7.0416 | 7.9879 |
| 36 | 390 | 3.5546 | 7.0434 | 92.709 | 0.94771 | 6.5715 | 7.0416 | 7.9893 |
| 37 | 420 | 3.8352 | 7.0639 | 92.75 | 0.94536 | 6.5896 | 7.0416 | 7.987 |
| 38 | 450 | 4.1124 | 7.0844 | 92.224 | 0.93729 | 6.6078 | 7.0416 | 7.9789 |
| 39 | 480 | 4.3913 | 7.105 | 91.577 | 0.92801 | 6.6199 | 7.0416 | 7.9696 |
| 40 | 510 | 4.6718 | 7.1259 | 90.606 | 0.91548 | 6.6276 | 7.0416 | 7.9571 |
| 41 | 540 | 4.9524 | 7.147 | 89.595 | 0.90259 | 6.6369 | 7.0416 | 7.9442 |
| 42 | 570 | 5.2279 | 7.1678 | 87.491 | 0.87885 | 6.6391 | 7.0416 | 7.9204 |
| 43 | 600 | 5.5068 | 7.1889 | 85.388 | 0.8552 | 6.6402 | 7.0416 | 7.8968 |
| 44 | 630 | 5.779 | 7.2097 | 83.932 | 0.83819 | 6.643 | 7.0416 | 7.8798 |
| 45 | 660 | 6.0528 | 7.2307 | 82.961 | 0.82609 | 6.6457 | 7.0416 | 7.8677 |
| 46 | 690 | 6.33 | 7.2521 | 81.586 | 0.81 | 6.6424 | 7.0416 | 7.8516 |
| 47 | 720 | 6.6072 | 7.2736 | 80.696 | 0.79879 | 6.6479 | 7.0416 | 7.8404 |
| 48 | 750 | 6.8844 | 7.2953 | 80.332 | 0.79283 | 6.6501 | 7.0416 | 7.8344 |
| 49 | 780 | 7.1633 | 7.3172 | 79.806 | 0.78528 | 6.6479 | 7.0416 | 7.8269 |
| 50 | 810 | 7.4405 | 7.3391 | 79.321 | 0.77817 | 6.654 | 7.0416 | 7.8198 |
| 51 | 840 | 7.7194 | 7.3613 | 78.835 | 0.77108 | 6.6534 | 7.0416 | 7.8127 |
| 52 | 870 | 7.9932 | 7.3832 | 78.471 | 0.76524 | 6.6463 | 7.0416 | 7.8068 |
| 53 | 900 | 8.2687 | 7.4054 | 78.552 | 0.76374 | 6.6578 | 7.0416 | 7.8053 |
| 54 | 930 | 8.5442 | 7.4277 | 78.35 | 0.75948 | 6.6573 | 7.0416 | 7.8011 |
| 55 | 960 | 8.8163 | 7.4498 | 78.229 | 0.75605 | 6.6551 | 7.0416 | 7.7977 |
| 56 | 990 | 9.0918 | 7.4724 | 78.188 | 0.75338 | 6.6606 | 7.0416 | 7.795 |
| 57 | 1020 | 9.3674 | 7.4951 | 78.148 | 0.75071 | 6.66 | 7.0416 | 7.7923 |
| 58 | 1050 | 9.6462 | 7.5183 | 78.188 | 0.74878 | 6.6529 | 7.0416 | 7.7904 |
| 59 | 1080 | 9.9251 | 7.5415 | 78.229 | 0.74686 | 6.6633 | 7.0416 | 7.7885 |
| 60 | 1110 | 10.202 | 7.5648 | 78.229 | 0.74456 | 6.6633 | 7.0416 | 7.7862 |
| 61 | 1140 | 10.478 | 7.5881 | 78.269 | 0.74266 | 6.6628 | 7.0416 | 7.7843 |
| 62 | 1170 | 10.752 | 7.6114 | 78.269 | 0.74039 | 6.6611 | 7.0416 | 7.782 |
| 63 | 1200 | 11.031 | 7.6352 | 78.148 | 0.73693 | 6.6589 | 7.0416 | 7.7785 |
| 64 | 1230 | 11.301 | 7.6585 | 78.35 | 0.73659 | 6.6551 | 7.0416 | 7.7782 |
| 65 | 1260 | 11.577 | 7.6824 | 78.35 | 0.7343 | 6.6633 | 7.0416 | 7.7759 |
| 66 | 1290 | 11.852 | 7.7064 | 78.309 | 0.73164 | 6.6622 | 7.0416 | 7.7732 |
| 67 | 1320 | 12.122 | 7.7301 | 78.471 | 0.7309 | 6.6611 | 7.0416 | 7.7725 |
| 68 | 1350 | 12.4 | 7.7546 | 78.431 | 0.72822 | 6.6595 | 7.0416 | 7.7698 |
| 69 | 1380 | 12.675 | 7.779 | 78.471 | 0.7263 | 6.6573 | 7.0416 | 7.7679 |
| 70 | 1410 | 12.949 | 7.8035 | 78.673 | 0.72589 | 6.6523 | 7.0416 | 7.7675 |
| [illegible] | 1440 | 13.225 | 7.8283 | 78.957 | 0.7262 | 6.6617 | 7.0416 | 7.7678 |
| [illegible] | 1470 | 13.505 | 7.8537 | 79.118 | 0.72533 | 6.6617 | 7.0416 | 7.7669 |
| 73 | 1500 | 13.781 | 7.8788 | 79.28 | 0.7245 | 6.6611 | 7.0416 | 7.7661 |
| 74 | 1530 | 14.051 | 7.9036 | 79.482 | 0.72407 | 6.66 | 7.0416 | 7.7657 |
| 75 | 1560 | 14.321 | 7.9285 | 79.685 | 0.72363 | 6.6573 | 7.0416 | 7.7652 |
| 76 | 1590 | 14.6 | 7.9544 | 79.766 | 0.72201 | 6.6606 | 7.0416 | 7.7636 |
| 77 | 1620 | 14.876 | 7.9801 | 79.887 | 0.72077 | 6.6622 | 7.0416 | 7.7624 |
| 78 | 1650 | 15.151 | 8.0061 | 80.13 | 0.72062 | 6.6622 | 7.0416 | 7.7622 |

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO-ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST18-1 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-1 | Test Date: 10/31/11 | Depth: 0.0"-30.0" |
| Test No.: 27.8 PSI | Sample Type: 3" ST | Elevation: ---- |

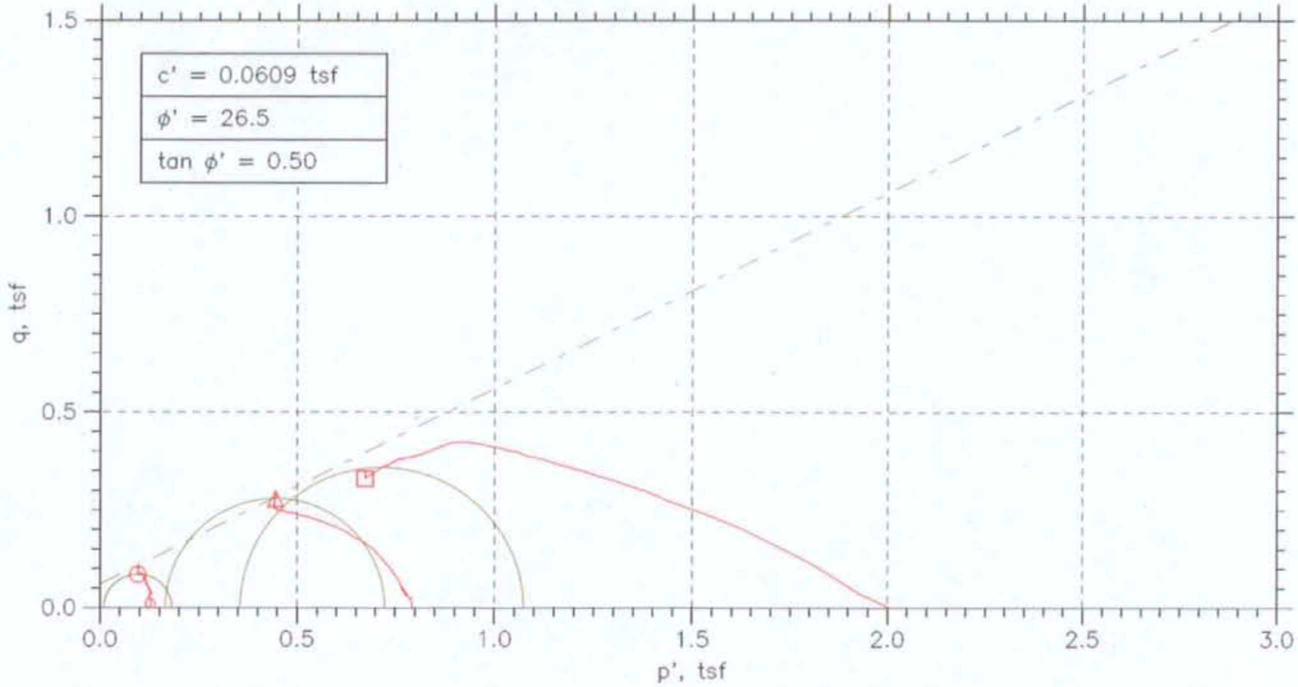
Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

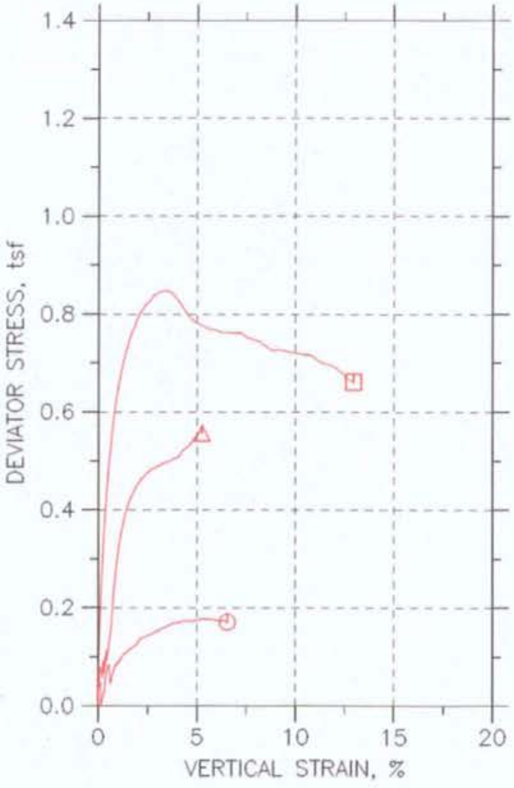
| | | |
|---|---|---|
| Specimen Height: 5.06 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.79 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 563.12 cc | Piston Weight: 0.00 lb | Correction Type: Uniform |

| | | |
|---|---|---|
| Liquid Limit: 67 | Plastic Limit: 62 | Estimated Specific Gravity: 3.00 |

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 7.0416 | 7.0416 | 0 | 0.000 | 1.9951 | 1.9951 | 1.000 | 1.9951 | 0 |
| 2 | 0.03 | 7.1059 | 7.0416 | 0.063817 | 0.993 | 1.9956 | 1.9313 | 1.033 | 1.9635 | 0.032145 |
| 3 | 0.07 | 7.177 | 7.0416 | 0.13148 | 0.971 | 1.999 | 1.8637 | 1.073 | 1.9313 | 0.06769 |
| 4 | 0.11 | 7.2313 | 7.0416 | 0.1887 | 0.995 | 1.9962 | 1.8064 | 1.105 | 1.9013 | 0.094855 |
| 5 | 0.15 | 7.2809 | 7.0416 | 0.23931 | 1.000 | 1.9951 | 1.7558 | 1.136 | 1.8755 | 0.11964 |
| 6 | 0.20 | 7.3274 | 7.0416 | 0.29158 | 1.020 | 1.9894 | 1.7036 | 1.168 | 1.8465 | 0.14291 |
| 7 | 0.24 | 7.3718 | 7.0416 | 0.33449 | 1.013 | 1.9908 | 1.6607 | 1.199 | 1.8257 | 0.16509 |
| 8 | 0.29 | 7.4114 | 7.0416 | 0.38785 | 1.049 | 1.9771 | 1.6073 | 1.230 | 1.7922 | 0.18489 |
| 9 | 0.33 | 7.448 | 7.0416 | 0.43461 | 1.069 | 1.9669 | 1.5605 | 1.260 | 1.7637 | 0.20319 |
| 10 | 0.38 | 7.4815 | 7.0416 | 0.47917 | 1.089 | 1.9559 | 1.516 | 1.290 | 1.7359 | 0.21996 |
| 11 | 0.42 | 7.5129 | 7.0416 | 0.52209 | 1.108 | 1.9444 | 1.4731 | 1.320 | 1.7087 | 0.23566 |
| 12 | 0.46 | 7.5426 | 7.0416 | 0.5606 | 1.119 | 1.9355 | 1.4345 | 1.349 | 1.685 | 0.25049 |
| 13 | 0.51 | 7.5705 | 7.0416 | 0.59911 | 1.133 | 1.9249 | 1.396 | 1.379 | 1.6605 | 0.26445 |
| 14 | 0.60 | 7.6195 | 7.0416 | 0.67668 | 1.171 | 1.8963 | 1.3185 | 1.438 | 1.6074 | 0.28893 |
| 15 | 0.69 | 7.6611 | 7.0416 | 0.74599 | 1.204 | 1.8686 | 1.2491 | 1.496 | 1.5589 | 0.30975 |
| 16 | 0.78 | 7.6984 | 7.0416 | 0.80706 | 1.229 | 1.8449 | 1.1881 | 1.553 | 1.5165 | 0.32839 |
| 17 | 0.87 | 7.7309 | 7.0416 | 0.86702 | 1.258 | 1.8174 | 1.1281 | 1.611 | 1.4728 | 0.34466 |
| 18 | 0.96 | 7.7596 | 7.0416 | 0.91544 | 1.275 | 1.7977 | 1.0797 | 1.665 | 1.4387 | 0.35899 |
| 19 | 1.05 | 7.7857 | 7.0416 | 0.9699 | 1.304 | 1.7693 | 1.0252 | 1.726 | 1.3973 | 0.37203 |
| 20 | 1.15 | 7.8087 | 7.0416 | 1.0167 | 1.325 | 1.7456 | 0.97848 | 1.784 | 1.362 | 0.38355 |
| 21 | 1.24 | 7.83 | 7.0416 | 1.0519 | 1.334 | 1.7317 | 0.94327 | 1.836 | 1.3375 | 0.3942 |
| 22 | 1.33 | 7.8483 | 7.0416 | 1.0981 | 1.361 | 1.7038 | 0.89706 | 1.899 | 1.3004 | 0.40336 |
| 23 | 1.42 | 7.8645 | 7.0416 | 1.1349 | 1.379 | 1.6831 | 0.8602 | 1.957 | 1.2716 | 0.41143 |
| 24 | 1.52 | 7.8789 | 7.0416 | 1.1652 | 1.392 | 1.6672 | 0.82994 | 2.009 | 1.2486 | 0.41863 |
| 25 | 1.61 | 7.892 | 7.0416 | 1.1999 | 1.411 | 1.6457 | 0.79528 | 2.069 | 1.2205 | 0.4252 |
| 26 | 1.70 | 7.9043 | 7.0416 | 1.2296 | 1.425 | 1.6282 | 0.76557 | 2.127 | 1.1969 | 0.43133 |
| 27 | 1.79 | 7.9174 | 7.0416 | 1.2538 | 1.432 | 1.6171 | 0.74137 | 2.181 | 1.1792 | 0.43788 |
| 28 | 1.89 | 7.927 | 7.0416 | 1.2807 | 1.446 | 1.5999 | 0.71441 | 2.239 | 1.1571 | 0.44272 |
| [illegible] | 1.98 | 7.9354 | 7.0416 | 1.2972 | 1.451 | 1.5917 | 0.69791 | 2.281 | 1.1448 | 0.44692 |
| [illegible] | 2.07 | 7.9426 | 7.0416 | 1.3247 | 1.470 | 1.5714 | 0.6704 | 2.344 | 1.1209 | 0.45048 |
| 31 | 2.17 | 7.9493 | 7.0416 | 1.3462 | 1.483 | 1.5566 | 0.64894 | 2.399 | 1.1028 | 0.45383 |
| 32 | 2.45 | 7.9647 | 7.0416 | 1.3985 | 1.515 | 1.5197 | 0.59668 | 2.547 | 1.0582 | 0.46153 |
| 33 | 2.73 | 7.9757 | 7.0416 | 1.4392 | 1.541 | 1.4901 | 0.55597 | 2.680 | 1.023 | 0.46706 |
| 34 | 3.00 | 7.9831 | 7.0416 | 1.4722 | 1.564 | 1.4645 | 0.52296 | 2.800 | 0.99371 | 0.47076 |
| 35 | 3.28 | 7.9879 | 7.0416 | 1.5035 | 1.589 | 1.4379 | 0.4916 | 2.925 | 0.96475 | 0.47315 |
| 36 | 3.55 | 7.9893 | 7.0416 | 1.525 | 1.609 | 1.4179 | 0.47015 | 3.016 | 0.944 | 0.47385 |
| 37 | 3.84 | 7.987 | 7.0416 | 1.5432 | 1.632 | 1.3974 | 0.45199 | 3.092 | 0.92467 | 0.47268 |
| 38 | 4.11 | 7.9789 | 7.0416 | 1.5613 | 1.666 | 1.3711 | 0.43384 | 3.160 | 0.90248 | 0.46865 |
| 39 | 4.39 | 7.9696 | 7.0416 | 1.5734 | 1.695 | 1.3497 | 0.42173 | 3.200 | 0.88574 | 0.464 |
| 40 | 4.67 | 7.9571 | 7.0416 | 1.5811 | 1.727 | 1.3295 | 0.41403 | 3.211 | 0.87177 | 0.45774 |
| 41 | 4.95 | 7.9442 | 7.0416 | 1.5905 | 1.762 | 1.3073 | 0.40468 | 3.230 | 0.85598 | 0.4513 |
| 42 | 5.23 | 7.9204 | 7.0416 | 1.5927 | 1.812 | 1.2813 | 0.40248 | 3.184 | 0.8419 | 0.43942 |
| 43 | 5.51 | 7.8968 | 7.0416 | 1.5938 | 1.864 | 1.2566 | 0.40138 | 3.131 | 0.82898 | 0.4276 |
| 44 | 5.78 | 7.8798 | 7.0416 | 1.5965 | 1.905 | 1.2368 | 0.39863 | 3.103 | 0.81772 | 0.4191 |
| 45 | 6.05 | 7.8677 | 7.0416 | 1.5993 | 1.936 | 1.222 | 0.39588 | 3.087 | 0.80892 | 0.41304 |
| 46 | 6.33 | 7.8516 | 7.0416 | 1.596 | 1.970 | 1.2092 | 0.39918 | 3.029 | 0.80418 | 0.405 |
| 47 | 6.61 | 7.8404 | 7.0416 | 1.6015 | 2.005 | 1.1925 | 0.39368 | 3.029 | 0.79307 | 0.3994 |
| 48 | 6.88 | 7.8344 | 7.0416 | 1.6037 | 2.023 | 1.1843 | 0.39148 | 3.025 | 0.78789 | 0.39641 |
| 49 | 7.16 | 7.8269 | 7.0416 | 1.6015 | 2.039 | 1.179 | 0.39368 | 2.995 | 0.78632 | 0.39264 |
| 50 | 7.44 | 7.8198 | 7.0416 | 1.6075 | 2.066 | 1.1658 | 0.38762 | 3.008 | 0.77671 | 0.38909 |
| 51 | 7.72 | 7.8127 | 7.0416 | 1.607 | 2.084 | 1.1593 | 0.38817 | 2.986 | 0.77372 | 0.38554 |
| 52 | 7.99 | 7.8068 | 7.0416 | 1.5998 | 2.091 | 1.1606 | 0.39533 | 2.936 | 0.77795 | 0.38262 |
| 53 | 8.27 | 7.8053 | 7.0416 | 1.6114 | 2.110 | 1.1475 | 0.38377 | 2.990 | 0.76564 | 0.38187 |
| 54 | 8.54 | 7.8011 | 7.0416 | 1.6108 | 2.121 | 1.1438 | 0.38432 | 2.976 | 0.76407 | 0.37974 |
| 55 | 8.82 | 7.7977 | 7.0416 | 1.6086 | 2.128 | 1.1426 | 0.38652 | 2.956 | 0.76455 | 0.37803 |
| 56 | 9.09 | 7.795 | 7.0416 | 1.6141 | 2.143 | 1.1344 | 0.38102 | 2.977 | 0.75771 | 0.37669 |
| 57 | 9.37 | 7.7923 | 7.0416 | 1.6136 | 2.149 | 1.1323 | 0.38157 | 2.967 | 0.75693 | 0.37535 |
| 58 | 9.65 | 7.7904 | 7.0416 | 1.6064 | 2.145 | 1.1375 | 0.38873 | 2.926 | 0.76312 | 0.37439 |
| 59 | 9.93 | 7.7885 | 7.0416 | 1.6169 | 2.165 | 1.1251 | 0.37827 | 2.974 | 0.7517 | 0.37343 |
| 60 | 10.20 | 7.7862 | 7.0416 | 1.6169 | 2.172 | 1.1228 | 0.37827 | 2.968 | 0.75055 | 0.37228 |
| 61 | 10.48 | 7.7843 | 7.0416 | 1.6163 | 2.176 | 1.1215 | 0.37882 | 2.960 | 0.75015 | 0.37133 |
| 62 | 10.75 | 7.782 | 7.0416 | 1.6147 | 2.181 | 1.1209 | 0.38047 | 2.946 | 0.75067 | 0.37019 |
| 63 | 11.03 | 7.7785 | 7.0416 | 1.6125 | 2.188 | 1.1196 | 0.38267 | 2.926 | 0.75114 | 0.36846 |
| 64 | 11.30 | 7.7782 | 7.0416 | 1.6086 | 2.184 | 1.1231 | 0.38652 | 2.906 | 0.75482 | 0.3683 |
| 65 | 11.58 | 7.7759 | 7.0416 | 1.6169 | 2.202 | 1.1126 | 0.37827 | 2.941 | 0.74542 | 0.36715 |
| 66 | 11.85 | 7.7732 | 7.0416 | 1.6158 | 2.208 | 1.111 | 0.37937 | 2.929 | 0.74519 | 0.36582 |
| 67 | 12.12 | 7.7725 | 7.0416 | 1.6147 | 2.209 | 1.1114 | 0.38047 | 2.921 | 0.74592 | 0.36545 |
| 68 | 12.40 | 7.7698 | 7.0416 | 1.613 | 2.215 | 1.1103 | 0.38212 | 2.906 | 0.74623 | 0.36411 |
| 69 | 12.68 | 7.7679 | 7.0416 | 1.6108 | 2.218 | 1.1106 | 0.38432 | 2.890 | 0.74747 | 0.36315 |
| [illegible] | 12.95 | 7.7675 | 7.0416 | 1.6059 | 2.212 | 1.1152 | 0.38928 | 2.865 | 0.75222 | 0.36295 |
| [illegible] | 13.22 | 7.7678 | 7.0416 | 1.6152 | 2.224 | 1.1061 | 0.37992 | 2.911 | 0.74302 | 0.3631 |
| 72 | 13.51 | 7.7669 | 7.0416 | 1.6152 | 2.227 | 1.1053 | 0.37992 | 2.909 | 0.74259 | 0.36267 |
| 73 | 13.78 | 7.7661 | 7.0416 | 1.6147 | 2.229 | 1.105 | 0.38047 | 2.904 | 0.74272 | 0.36225 |
| 74 | 14.05 | 7.7657 | 7.0416 | 1.6136 | 2.228 | 1.1056 | 0.38157 | 2.898 | 0.74361 | 0.36204 |
| 75 | 14.32 | 7.7652 | 7.0416 | 1.6108 | 2.226 | 1.108 | 0.38432 | 2.883 | 0.74614 | 0.36181 |
| 76 | 14.60 | 7.7636 | 7.0416 | 1.6141 | 2.236 | 1.103 | 0.38102 | 2.895 | 0.74203 | 0.361 |
| 77 | 14.88 | 7.7624 | 7.0416 | 1.6158 | 2.242 | 1.1001 | 0.37937 | 2.900 | 0.73976 | 0.36039 |
| 78 | 15.15 | 7.7622 | 7.0416 | 1.6158 | 2.242 | 1.1 | 0.37937 | 2.900 | 0.73968 | 0.36031 |

# TRIAXIAL COMPRESSION TEST REPORT





| Symbol | | ○ | △ | □ | |
|---|---|---|---|---|---|
| Test No. | | 2.0 PSI | 11.1 PSI | 27.8 PSI | |
| Initial | Diameter, in | 2.8268 | 2.9244 | 2.9858 | |
| | Height, in | 5.8921 | 5.3862 | 4.6886 | |
| | Water Content, % | 480.35 | 391.31 | 297.05 | |
| | Dry Density, pcf | 12.6 | 15.21 | 19.25 | |
| | Saturation, % | 103.96 | 103.80 | 102.14 | |
| | Void Ratio | 13.834 | 11.287 | 8.7077 | |
| Before Shear | Water Content, % | 391.31 | 297.05 | 236.77 | |
| | Dry Density, pcf | 14.7 | 18.89 | 23.11 | |
| | Saturation, % | 100.00 | 100.00 | 100.00 | |
| | Void Ratio | 11.716 | 8.8938 | 7.0888 | |
| | Back Press., tsf | 5.0438 | 5.0438 | 5.0399 | |
| Minor Prin. Stress, tsf | | 0.14018 | 0.79538 | 2.0089 | |
| Max. Dev. Stress, tsf | | 0.17896 | 0.55935 | 0.84871 | |
| Time to Failure, min | | 375 | 335 | 330 | |
| Strain Rate, %/min | | 0.02 | 0.02 | 0.02 | |
| B-Value | | .99 | --- | --- | |
| Measured Specific Gravity | | 2.99 | 2.99 | 2.99 | |
| Liquid Limit | | 77 | 77 | 77 | |
| Plastic Limit | | 74 | 74 | 74 | |
| Plasticity Index | | 3 | 3 | 3 | |
| Failure Sketch | |  |  |  | |

Project: RICO-ARGENTINE SITE OU01

Location: RICO, CO

Project No.: 60157757

ring No.: ST18-3

Sample Type: 3 " ST

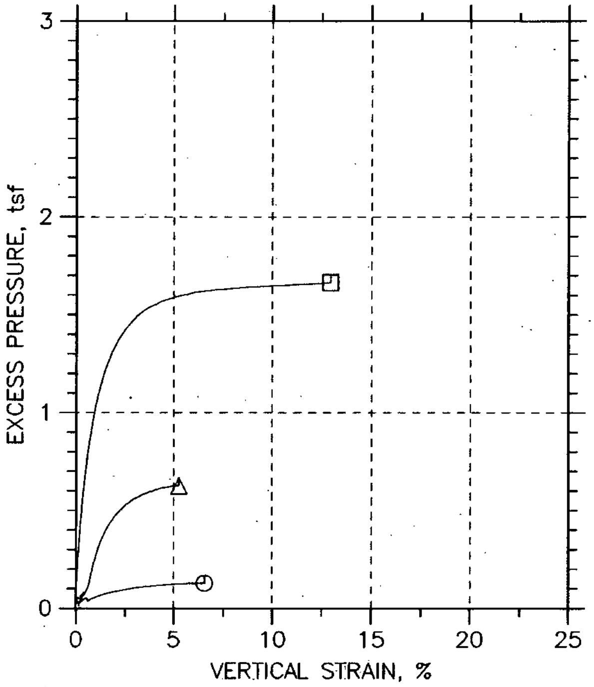
Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST

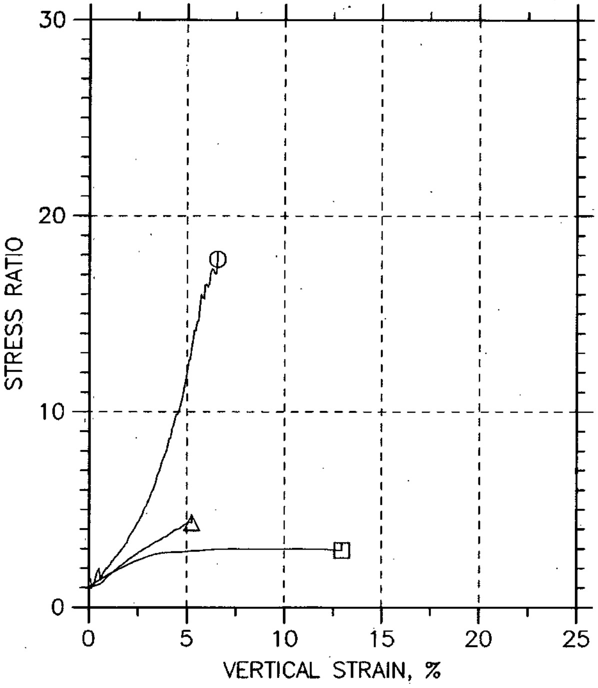
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

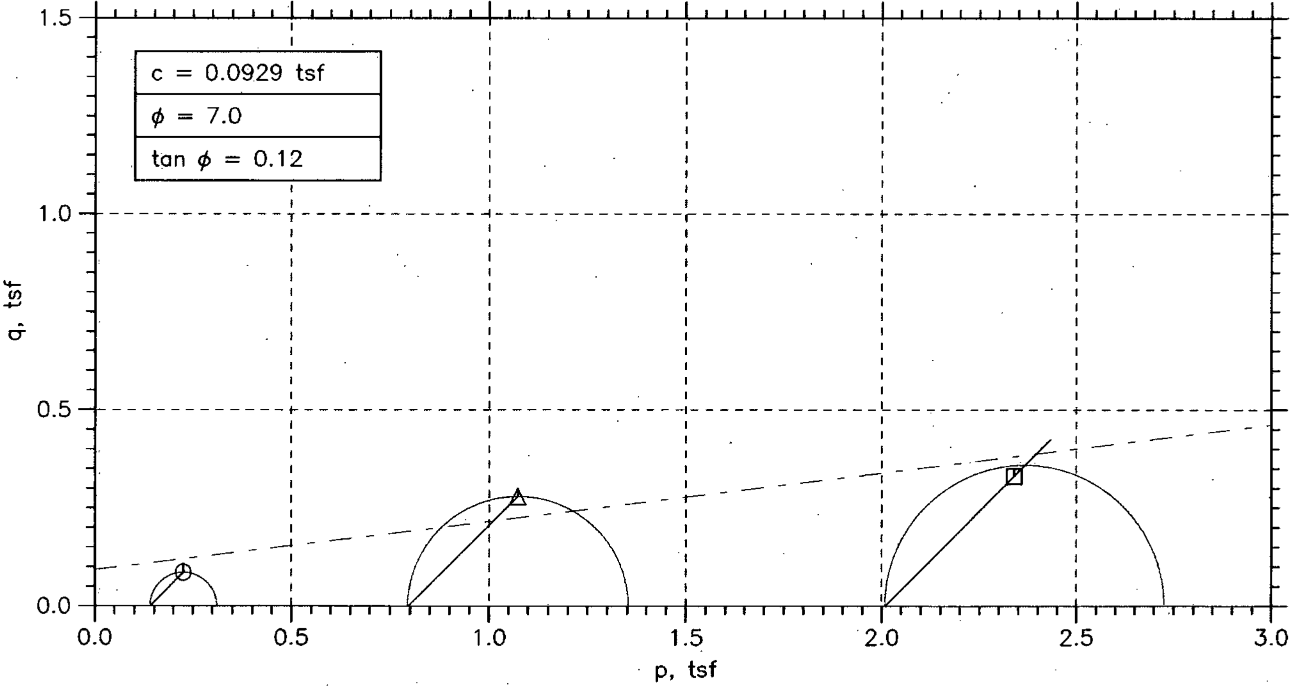
Thu, 03-NOV-2011 17:03:27

# TRIAXIAL COMPRESSION TEST REPORT

AECOM







| | | |
|---|---|---|
| Project: RICO-ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 10/28/11 | Depth: 12.0'-42.0' |
| st No.: ST18-3 | Sample Type: 3 " ST | Elevation: ---- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN | | |
| Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767 | | |
| | | |

Thu, 03-NOV-2011 14:24:53

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 2.0 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/28/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 12.0'-42.0'
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Sp[illegible]men Height: 5.89 in
Specimen Area: 6.28 in^2
Specimen Volume: 605.96 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 77

Plastic Limit: 74

Measured Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.2758 | 0 | 0 | 5.0438 | 5.184 | 5.184 |
| 2 | 2.0039 | 0.024651 | 6.2774 | 3.0173 | 0.034608 | 5.0627 | 5.184 | 5.2186 |
| 3 | 4.0034 | 0.052383 | 6.2791 | 3.4408 | 0.039454 | 5.0694 | 5.184 | 5.2235 |
| 4 | 6.0034 | 0.080116 | 6.2809 | 3.7584 | 0.043084 | 5.0733 | 5.184 | 5.2271 |
| 5 | 8.0034 | 0.10785 | 6.2826 | 4.0231 | 0.046106 | 5.0766 | 5.184 | 5.2301 |
| 6 | 10.003 | 0.13712 | 6.2844 | 4.2348 | 0.048518 | 5.0794 | 5.184 | 5.2325 |
| 7 | 12.003 | 0.16639 | 6.2863 | 0.10587 | 0.0012126 | 5.0549 | 5.184 | 5.1852 |
| 8 | 14.003 | 0.19259 | 6.2879 | 0.68816 | 0.0078798 | 5.0694 | 5.184 | 5.1919 |
| 9 | 16.004 | 0.22186 | 6.2898 | 1.1646 | 0.013331 | 5.0738 | 5.184 | 5.1973 |
| 10 | 18.004 | 0.24959 | 6.2915 | 1.5881 | 0.018174 | 5.0766 | 5.184 | 5.2022 |
| 11 | 20.004 | 0.27732 | 6.2933 | 2.0116 | 0.023014 | 5.0799 | 5.184 | 5.207 |
| 12 | 22.004 | 0.3066 | 6.2951 | 2.3821 | 0.027245 | 5.0821 | 5.184 | 5.2112 |
| 13 | 24.004 | 0.33433 | 6.2969 | 2.8056 | 0.03208 | 5.0849 | 5.184 | 5.2161 |
| 14 | 26.004 | 0.36206 | 6.2986 | 4.1819 | 0.047804 | 5.0866 | 5.184 | 5.2318 |
| 15 | 28.004 | 0.39133 | 6.3005 | 5.0818 | 0.058073 | 5.0888 | 5.184 | 5.2421 |
| 16 | 30.004 | 0.41907 | 6.3022 | 5.8759 | 0.067129 | 5.0899 | 5.184 | 5.2511 |
| 17 | 35.004 | 0.4884 | 6.3066 | 7.0934 | 0.080982 | 5.0938 | 5.184 | 5.265 |
| 18 | 40.004 | 0.55927 | 6.3111 | 7.411 | 0.084548 | 5.0977 | 5.184 | 5.2685 |
| 19 | 45.004 | 0.63168 | 6.3157 | 4.076 | 0.046467 | 5.0816 | 5.184 | 5.2305 |
| 20 | 50.004 | 0.70101 | 6.3201 | 5.1348 | 0.058496 | 5.0882 | 5.184 | 5.2425 |
| 21 | 55.004 | 0.77034 | 6.3246 | 6.1405 | 0.069905 | 5.0932 | 5.184 | 5.2539 |
| 22 | 60.004 | 0.84121 | 6.3291 | 6.9875 | 0.07949 | 5.0944 | 5.184 | 5.2635 |
| 23 | 65.004 | 0.91208 | 6.3336 | 7.5698 | 0.086053 | 5.0982 | 5.184 | 5.2701 |
| 24 | 70.004 | 0.98142 | 6.338 | 7.5698 | 0.085993 | 5.0994 | 5.184 | 5.27 |
| 25 | 75.004 | 1.0507 | 6.3425 | 8.0991 | 0.091942 | 5.1032 | 5.184 | 5.2759 |
| 26 | 80.004 | 1.1201 | 6.3469 | 8.258 | 0.093679 | 5.1066 | 5.184 | 5.2777 |
| 27 | 85.004 | 1.1894 | 6.3514 | 8.8932 | 0.10081 | 5.1088 | 5.184 | 5.2848 |
| 28 | 90.004 | 1.2587 | 6.3558 | 9.052 | 0.10254 | 5.111 | 5.184 | 5.2865 |
| 29 | 95.004 | 1.3296 | 6.3604 | 9.4755 | 0.10726 | 5.1132 | 5.184 | 5.2913 |
| [illegible] | 100 | 1.3989 | 6.3649 | 9.6343 | 0.10898 | 5.1155 | 5.184 | 5.293 |
| [illegible] | 105 | 1.4683 | 6.3694 | 9.6872 | 0.10951 | 5.1177 | 5.184 | 5.2935 |
| 32 | 110 | 1.5376 | 6.3738 | 10.111 | 0.11421 | 5.1193 | 5.184 | 5.2982 |
| 33 | 115 | 1.6085 | 6.3784 | 10.27 | 0.11592 | 5.1216 | 5.184 | 5.2999 |
| 34 | 120 | 1.6778 | 6.3829 | 10.481 | 0.11823 | 5.1232 | 5.184 | 5.3022 |
| 35 | 125 | 1.7487 | 6.3875 | 10.693 | 0.12053 | 5.1249 | 5.184 | 5.3045 |
| 36 | 130 | 1.818 | 6.392 | 10.799 | 0.12164 | 5.1266 | 5.184 | 5.3056 |
| 37 | 135 | 1.8889 | 6.3967 | 11.116 | 0.12513 | 5.1282 | 5.184 | 5.3091 |
| 38 | 140 | 1.9597 | 6.4013 | 11.169 | 0.12563 | 5.1299 | 5.184 | 5.3096 |
| 39 | 145 | 2.0291 | 6.4058 | 11.699 | 0.13149 | 5.1316 | 5.184 | 5.3155 |
| 40 | 150 | 2.1 | 6.4104 | 12.175 | 0.13675 | 5.1327 | 5.184 | 5.3207 |
| 41 | 155 | 2.1708 | 6.4151 | 12.334 | 0.13843 | 5.1343 | 5.184 | 5.3224 |
| 42 | 160 | 2.2417 | 6.4197 | 12.493 | 0.14011 | 5.1354 | 5.184 | 5.3241 |
| 43 | 165 | 2.311 | 6.4243 | 12.546 | 0.14061 | 5.1371 | 5.184 | 5.3246 |
| 44 | 170 | 2.3819 | 6.429 | 12.705 | 0.14228 | 5.1382 | 5.184 | 5.3263 |
| 45 | 175 | 2.4512 | 6.4335 | 12.863 | 0.14396 | 5.1399 | 5.184 | 5.328 |
| 46 | 180 | 2.5206 | 6.4381 | 12.969 | 0.14504 | 5.141 | 5.184 | 5.329 |
| 47 | 185 | 2.5914 | 6.4428 | 13.022 | 0.14553 | 5.1421 | 5.184 | 5.3295 |
| 48 | 190 | 2.6608 | 6.4474 | 13.075 | 0.14601 | 5.1438 | 5.184 | 5.33 |
| 49 | 195 | 2.7301 | 6.452 | 13.234 | 0.14768 | 5.1443 | 5.184 | 5.3317 |
| 50 | 200 | 2.801 | 6.4567 | 13.499 | 0.15053 | 5.146 | 5.184 | 5.3345 |
| 51 | 205 | 2.8703 | 6.4613 | 13.657 | 0.15219 | 5.1471 | 5.184 | 5.3362 |
| 52 | 210 | 2.9396 | 6.4659 | 13.657 | 0.15208 | 5.1477 | 5.184 | 5.3361 |
| 53 | 215 | 3.0105 | 6.4706 | 13.975 | 0.1555 | 5.1488 | 5.184 | 5.3395 |
| 54 | 220 | 3.0798 | 6.4753 | 13.869 | 0.15421 | 5.1499 | 5.184 | 5.3382 |
| 55 | 225 | 3.1507 | 6.48 | 14.24 | 0.15822 | 5.1504 | 5.184 | 5.3422 |
| 56 | 230 | 3.22 | 6.4846 | 14.346 | 0.15928 | 5.1516 | 5.184 | 5.3433 |
| 57 | 235 | 3.2878 | 6.4892 | 14.398 | 0.15976 | 5.1521 | 5.184 | 5.3438 |
| 58 | 240 | 3.3572 | 6.4938 | 14.451 | 0.16023 | 5.1532 | 5.184 | 5.3442 |
| 59 | 245 | 3.428 | 6.4986 | 14.557 | 0.16128 | 5.1543 | 5.184 | 5.3453 |
| 60 | 250 | 3.4974 | 6.5033 | 14.822 | 0.1641 | 5.1554 | 5.184 | 5.3481 |
| 61 | 255 | 3.5651 | 6.5078 | 14.875 | 0.16457 | 5.156 | 5.184 | 5.3486 |
| 62 | 260 | 3.636 | 6.5126 | 14.981 | 0.16562 | 5.1565 | 5.184 | 5.3496 |
| 63 | 265 | 3.7053 | 6.5173 | 15.193 | 0.16784 | 5.1577 | 5.184 | 5.3518 |
| 64 | 270 | 3.7747 | 6.522 | 15.298 | 0.16889 | 5.1582 | 5.184 | 5.3529 |
| 65 | 275 | 3.844 | 6.5267 | 15.351 | 0.16935 | 5.1588 | 5.184 | 5.3533 |
| 66 | 280 | 3.9133 | 6.5314 | 15.404 | 0.16981 | 5.1593 | 5.184 | 5.3538 |
| 67 | 285 | 3.9842 | 6.5363 | 15.457 | 0.17027 | 5.1599 | 5.184 | 5.3543 |
| 68 | 290 | 4.0535 | 6.541 | 15.563 | 0.17131 | 5.161 | 5.184 | 5.3553 |
| 69 | 295 | 4.1229 | 6.5457 | 15.616 | 0.17177 | 5.1615 | 5.184 | 5.3558 |
| 70 | 300 | 4.1937 | 6.5505 | 15.669 | 0.17222 | 5.1615 | 5.184 | 5.3562 |
| [illegible] | 305 | 4.2646 | 6.5554 | 15.828 | 0.17384 | 5.1627 | 5.184 | 5.3578 |
| [illegible] | 310 | 4.3355 | 6.5603 | 15.828 | 0.17371 | 5.1632 | 5.184 | 5.3577 |
| 73 | 315 | 4.4064 | 6.5651 | 15.881 | 0.17416 | 5.1638 | 5.184 | 5.3582 |
| 74 | 320 | 4.4757 | 6.5699 | 15.987 | 0.1752 | 5.1643 | 5.184 | 5.3592 |
| 75 | 325 | 4.5466 | 6.5748 | 15.934 | 0.17449 | 5.1643 | 5.184 | 5.3585 |
| 76 | 330 | 4.6174 | 6.5796 | 15.828 | 0.1732 | 5.1649 | 5.184 | 5.3572 |
| 77 | 335 | 4.6868 | 6.5844 | 15.881 | 0.17365 | 5.1654 | 5.184 | 5.3577 |
| 78 | 340 | 4.7592 | 6.5894 | 15.934 | 0.1741 | 5.166 | 5.184 | 5.3581 |
| 79 | 345 | 4.8285 | 6.5942 | 15.934 | 0.17397 | 5.1665 | 5.184 | 5.358 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 80 | 350 | 4.8994 | 6.5991 | 15.987 | 0.17442 | 5.1671 | 5.184 | 5.3584 |
| 81 | 355 | 4.9702 | 6.6041 | 16.039 | 0.17487 | 5.1677 | 5.184 | 5.3589 |
| 82 | 360 | 5.0411 | 6.609 | 16.039 | 0.17474 | 5.1682 | 5.184 | 5.3587 |
| 83 | 365 | 5.1104 | 6.6138 | 16.251 | 0.17692 | 5.1688 | 5.184 | 5.3609 |
| 84 | 370 | 5.1798 | 6.6187 | 16.357 | 0.17794 | 5.1688 | 5.184 | 5.3619 |
| 85 | 375 | 5.2507 | 6.6236 | 16.463 | 0.17896 | 5.1693 | 5.184 | 5.363 |
| 86 | 380 | 5.3215 | 6.6286 | 16.41 | 0.17825 | 5.1699 | 5.184 | 5.3622 |
| 87 | 385 | 5.3909 | 6.6334 | 16.463 | 0.17869 | 5.1704 | 5.184 | 5.3627 |
| [illegible]8 | 390 | 5.4617 | 6.6384 | 16.463 | 0.17856 | 5.1704 | 5.184 | 5.3626 |
| [illegible] | 395 | 5.5311 | 6.6433 | 16.304 | 0.1767 | 5.171 | 5.184 | 5.3607 |
| [illegible]0 | 400 | 5.6004 | 6.6482 | 16.41 | 0.17772 | 5.171 | 5.184 | 5.3617 |
| 91 | 405 | 5.6728 | 6.6533 | 16.463 | 0.17816 | 5.1715 | 5.184 | 5.3622 |
| 92 | 410 | 5.7406 | 6.658 | 16.516 | 0.1786 | 5.1721 | 5.184 | 5.3626 |
| 93 | 415 | 5.8115 | 6.6631 | 16.357 | 0.17675 | 5.1721 | 5.184 | 5.3608 |
| 94 | 420 | 5.8808 | 6.668 | 16.304 | 0.17605 | 5.1721 | 5.184 | 5.3601 |
| 95 | 425 | 5.9501 | 6.6729 | 16.304 | 0.17592 | 5.1727 | 5.184 | 5.3599 |
| 96 | 430 | 6.021 | 6.6779 | 16.304 | 0.17579 | 5.1727 | 5.184 | 5.3598 |
| 97 | 435 | 6.0888 | 6.6827 | 16.198 | 0.17452 | 5.1727 | 5.184 | 5.3585 |
| 98 | 440 | 6.1581 | 6.6877 | 16.357 | 0.1761 | 5.1727 | 5.184 | 5.3601 |
| 99 | 445 | 6.2305 | 6.6928 | 16.145 | 0.17369 | 5.1732 | 5.184 | 5.3577 |
| 100 | 450 | 6.2999 | 6.6978 | 16.357 | 0.17584 | 5.1732 | 5.184 | 5.3598 |
| 101 | 455 | 6.3692 | 6.7027 | 16.357 | 0.17571 | 5.1732 | 5.184 | 5.3597 |
| 102 | 460 | 6.4401 | 6.7078 | 16.145 | 0.1733 | 5.1732 | 5.184 | 5.3573 |
| 103 | 465 | 6.5094 | 6.7128 | 16.145 | 0.17317 | 5.1732 | 5.184 | 5.3572 |
| 104 | 469.42 | 6.571 | 6.7172 | 16.039 | 0.17192 | 5.1738 | 5.184 | 5.3559 |

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 2.0 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/28/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 12.0'-42.0'
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Re[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Spe[illegible]men Height: 5.89 in
Specimen Area: 6.28 in^2
Specimen Volume: 605.96 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 77

Plastic Limit: 74

Measured Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.184 | 5.184 | 0 | 0.000 | 0.14018 | 0.14018 | 1.000 | 0.14018 | 0 |
| 2 | 0.02 | 5.2186 | 5.184 | 0.01888 | 0.546 | 0.15591 | 0.1213 | 1.285 | 0.1386 | 0.017304 |
| 3 | 0.05 | 5.2235 | 5.184 | 0.025544 | 0.647 | 0.15409 | 0.11463 | 1.344 | 0.13436 | 0.019727 |
| 4 | 0.08 | 5.2271 | 5.184 | 0.029431 | 0.683 | 0.15383 | 0.11075 | 1.389 | 0.13229 | 0.021542 |
| 5 | 0.11 | 5.2301 | 5.184 | 0.032763 | 0.711 | 0.15352 | 0.10741 | 1.429 | 0.13047 | 0.023053 |
| 6 | 0.14 | 5.2325 | 5.184 | 0.035539 | 0.732 | 0.15316 | 0.10464 | 1.464 | 0.1289 | 0.024259 |
| 7 | 0.17 | 5.1852 | 5.184 | 0.011106 | 9.159 | 0.13028 | 0.12907 | 1.009 | 0.12968 | 0.0006063 |
| 8 | 0.19 | 5.1919 | 5.184 | 0.025544 | 3.242 | 0.12251 | 0.11463 | 1.069 | 0.11857 | 0.0039399 |
| 9 | 0.22 | 5.1973 | 5.184 | 0.029986 | 2.249 | 0.12352 | 0.11019 | 1.121 | 0.11686 | 0.0066656 |
| 10 | 0.25 | 5.2022 | 5.184 | 0.032763 | 1.803 | 0.12559 | 0.10741 | 1.169 | 0.1165 | 0.0090869 |
| 11 | 0.28 | 5.207 | 5.184 | 0.036095 | 1.568 | 0.1271 | 0.10408 | 1.221 | 0.11559 | 0.011507 |
| 12 | 0.31 | 5.2112 | 5.184 | 0.038316 | 1.406 | 0.12911 | 0.10186 | 1.267 | 0.11548 | 0.013623 |
| 13 | 0.33 | 5.2161 | 5.184 | 0.041092 | 1.281 | 0.13116 | 0.099085 | 1.324 | 0.11512 | 0.01604 |
| 14 | 0.36 | 5.2318 | 5.184 | 0.042758 | 0.894 | 0.14522 | 0.097419 | 1.491 | 0.12132 | 0.023902 |
| 15 | 0.39 | 5.2421 | 5.184 | 0.04498 | 0.775 | 0.15327 | 0.095198 | 1.610 | 0.12423 | 0.029037 |
| 16 | 0.42 | 5.2511 | 5.184 | 0.04609 | 0.687 | 0.16122 | 0.094087 | 1.713 | 0.12765 | 0.033564 |
| 17 | 0.49 | 5.265 | 5.184 | 0.049977 | 0.617 | 0.17118 | 0.0902 | 1.898 | 0.13069 | 0.040491 |
| 18 | 0.56 | 5.2685 | 5.184 | 0.053864 | 0.637 | 0.17086 | 0.086313 | 1.980 | 0.12859 | 0.042274 |
| 19 | 0.63 | 5.2305 | 5.184 | 0.037761 | 0.813 | 0.14888 | 0.10242 | 1.454 | 0.12565 | 0.023234 |
| 20 | 0.70 | 5.2425 | 5.184 | 0.044424 | 0.759 | 0.15425 | 0.095753 | 1.611 | 0.125 | 0.029248 |
| 21 | 0.77 | 5.2539 | 5.184 | 0.049422 | 0.707 | 0.16066 | 0.090755 | 1.770 | 0.12571 | 0.034953 |
| 22 | 0.84 | 5.2635 | 5.184 | 0.050533 | 0.636 | 0.16914 | 0.089645 | 1.887 | 0.12939 | 0.039745 |
| 23 | 0.91 | 5.2701 | 5.184 | 0.05442 | 0.632 | 0.17181 | 0.085758 | 2.003 | 0.12878 | 0.043026 |
| 24 | 0.98 | 5.27 | 5.184 | 0.05553 | 0.646 | 0.17064 | 0.084647 | 2.016 | 0.12764 | 0.042996 |
| 25 | 1.05 | 5.2759 | 5.184 | 0.059417 | 0.646 | 0.1727 | 0.08076 | 2.138 | 0.12673 | 0.045971 |
| 26 | 1.12 | 5.2777 | 5.184 | 0.062749 | 0.670 | 0.17111 | 0.077428 | 2.210 | 0.12427 | 0.046839 |
| 27 | 1.19 | 5.2848 | 5.184 | 0.064971 | 0.644 | 0.17602 | 0.075207 | 2.340 | 0.12561 | 0.050407 |
| 28 | 1.26 | 5.2865 | 5.184 | 0.067192 | 0.655 | 0.17553 | 0.072986 | 2.405 | 0.12426 | 0.051271 |
| [illegible] | 1.33 | 5.2913 | 5.184 | 0.069413 | 0.647 | 0.17803 | 0.070764 | 2.516 | 0.1244 | 0.053631 |
| [illegible] | 1.40 | 5.293 | 5.184 | 0.071634 | 0.657 | 0.17753 | 0.068543 | 2.590 | 0.12304 | 0.054492 |
| 31 | 1.47 | 5.2935 | 5.184 | 0.073855 | 0.674 | 0.17583 | 0.066322 | 2.651 | 0.12107 | 0.054753 |
| 32 | 1.54 | 5.2982 | 5.184 | 0.075521 | 0.661 | 0.17887 | 0.064656 | 2.766 | 0.12176 | 0.057106 |
| 33 | 1.61 | 5.2999 | 5.184 | 0.077743 | 0.671 | 0.17836 | 0.062435 | 2.857 | 0.1204 | 0.057961 |
| 34 | 1.68 | 5.3022 | 5.184 | 0.079408 | 0.672 | 0.179 | 0.060769 | 2.946 | 0.11988 | 0.059115 |
| 35 | 1.75 | 5.3045 | 5.184 | 0.081074 | 0.673 | 0.17963 | 0.059103 | 3.039 | 0.11937 | 0.060266 |
| 36 | 1.82 | 5.3056 | 5.184 | 0.08274 | 0.680 | 0.17908 | 0.057437 | 3.118 | 0.11826 | 0.060819 |
| 37 | 1.89 | 5.3091 | 5.184 | 0.084406 | 0.675 | 0.1809 | 0.055771 | 3.244 | 0.11833 | 0.062563 |
| 38 | 1.96 | 5.3096 | 5.184 | 0.086072 | 0.685 | 0.17974 | 0.054105 | 3.322 | 0.11692 | 0.062815 |
| 39 | 2.03 | 5.3155 | 5.184 | 0.087738 | 0.667 | 0.18393 | 0.052439 | 3.507 | 0.11819 | 0.065746 |
| 40 | 2.10 | 5.3207 | 5.184 | 0.088849 | 0.650 | 0.18808 | 0.051329 | 3.664 | 0.1197 | 0.068374 |
| 41 | 2.17 | 5.3224 | 5.184 | 0.090514 | 0.654 | 0.18809 | 0.049663 | 3.787 | 0.11888 | 0.069215 |
| 42 | 2.24 | 5.3241 | 5.184 | 0.091625 | 0.654 | 0.18866 | 0.048552 | 3.886 | 0.11861 | 0.070056 |
| 43 | 2.31 | 5.3246 | 5.184 | 0.093291 | 0.663 | 0.18749 | 0.046886 | 3.999 | 0.11719 | 0.070303 |
| 44 | 2.38 | 5.3263 | 5.184 | 0.094402 | 0.663 | 0.18806 | 0.045776 | 4.108 | 0.11692 | 0.071141 |
| 45 | 2.45 | 5.328 | 5.184 | 0.096068 | 0.667 | 0.18807 | 0.04411 | 4.264 | 0.11609 | 0.071979 |
| 46 | 2.52 | 5.329 | 5.184 | 0.097178 | 0.670 | 0.18804 | 0.042999 | 4.373 | 0.11552 | 0.07252 |
| 47 | 2.59 | 5.3295 | 5.184 | 0.098289 | 0.675 | 0.18741 | 0.041889 | 4.474 | 0.11465 | 0.072763 |
| 48 | 2.66 | 5.33 | 5.184 | 0.099955 | 0.685 | 0.18624 | 0.040223 | 4.630 | 0.11323 | 0.073007 |
| 49 | 2.73 | 5.3317 | 5.184 | 0.10051 | 0.681 | 0.18735 | 0.039667 | 4.723 | 0.11351 | 0.073841 |
| 50 | 2.80 | 5.3345 | 5.184 | 0.10218 | 0.679 | 0.18853 | 0.038002 | 4.961 | 0.11326 | 0.075263 |
| 51 | 2.87 | 5.3362 | 5.184 | 0.10329 | 0.679 | 0.18908 | 0.036891 | 5.125 | 0.11298 | 0.076094 |
| 52 | 2.94 | 5.3361 | 5.184 | 0.10384 | 0.683 | 0.18842 | 0.036336 | 5.185 | 0.11238 | 0.07604 |
| 53 | 3.01 | 5.3395 | 5.184 | 0.10495 | 0.675 | 0.19073 | 0.035225 | 5.415 | 0.11298 | 0.077751 |
| 54 | 3.08 | 5.3382 | 5.184 | 0.10606 | 0.688 | 0.18833 | 0.034114 | 5.521 | 0.11122 | 0.077107 |
| 55 | 3.15 | 5.3422 | 5.184 | 0.10662 | 0.674 | 0.19178 | 0.033559 | 5.715 | 0.11267 | 0.079109 |
| 56 | 3.22 | 5.3433 | 5.184 | 0.10773 | 0.676 | 0.19173 | 0.032449 | 5.909 | 0.11209 | 0.07964 |
| 57 | 3.29 | 5.3438 | 5.184 | 0.10828 | 0.678 | 0.19165 | 0.031893 | 6.009 | 0.11177 | 0.079878 |
| 58 | 3.36 | 5.3442 | 5.184 | 0.10939 | 0.683 | 0.19101 | 0.030783 | 6.205 | 0.1109 | 0.080115 |
| 59 | 3.43 | 5.3453 | 5.184 | 0.11051 | 0.685 | 0.19096 | 0.029672 | 6.436 | 0.11031 | 0.080642 |
| 60 | 3.50 | 5.3481 | 5.184 | 0.11162 | 0.680 | 0.19266 | 0.028561 | 6.745 | 0.11061 | 0.08205 |
| 61 | 3.57 | 5.3486 | 5.184 | 0.11217 | 0.682 | 0.19258 | 0.028006 | 6.876 | 0.11029 | 0.082285 |
| 62 | 3.64 | 5.3496 | 5.184 | 0.11273 | 0.681 | 0.19307 | 0.027451 | 7.033 | 0.11026 | 0.08281 |
| 63 | 3.71 | 5.3518 | 5.184 | 0.11384 | 0.678 | 0.19418 | 0.02634 | 7.372 | 0.11026 | 0.08392 |
| 64 | 3.77 | 5.3529 | 5.184 | 0.11439 | 0.677 | 0.19467 | 0.025785 | 7.550 | 0.11023 | 0.084444 |
| 65 | 3.84 | 5.3533 | 5.184 | 0.11495 | 0.679 | 0.19458 | 0.02523 | 7.712 | 0.1099 | 0.084675 |
| 66 | 3.91 | 5.3538 | 5.184 | 0.1155 | 0.680 | 0.19448 | 0.024674 | 7.882 | 0.10958 | 0.084905 |
| 67 | 3.98 | 5.3543 | 5.184 | 0.11606 | 0.682 | 0.19439 | 0.024119 | 8.060 | 0.10925 | 0.085134 |
| 68 | 4.05 | 5.3553 | 5.184 | 0.11717 | 0.684 | 0.19432 | 0.023008 | 8.446 | 0.10866 | 0.085656 |
| 69 | 4.12 | 5.3558 | 5.184 | 0.11772 | 0.685 | 0.19422 | 0.022453 | 8.650 | 0.10834 | 0.085885 |
| [illegible] | 4.19 | 5.3562 | 5.184 | 0.11772 | 0.684 | 0.19468 | 0.022453 | 8.670 | 0.10857 | 0.086112 |
| [illegible] | 4.26 | 5.3578 | 5.184 | 0.11883 | 0.684 | 0.19518 | 0.021342 | 9.145 | 0.10826 | 0.086921 |
| 72 | 4.34 | 5.3577 | 5.184 | 0.11939 | 0.687 | 0.1945 | 0.020787 | 9.357 | 0.10764 | 0.086856 |
| 73 | 4.41 | 5.3582 | 5.184 | 0.11995 | 0.689 | 0.1944 | 0.020232 | 9.608 | 0.10731 | 0.087082 |
| 74 | 4.48 | 5.3592 | 5.184 | 0.1205 | 0.688 | 0.19487 | 0.019677 | 9.904 | 0.10728 | 0.087599 |
| 75 | 4.55 | 5.3585 | 5.184 | 0.1205 | 0.691 | 0.19417 | 0.019677 | 9.868 | 0.10692 | 0.087244 |
| 76 | 4.62 | 5.3572 | 5.184 | 0.12106 | 0.699 | 0.19232 | 0.019121 | 10.058 | 0.10572 | 0.0866 |
| 77 | 4.69 | 5.3577 | 5.184 | 0.12161 | 0.700 | 0.19222 | 0.018566 | 10.353 | 0.10539 | 0.086827 |
| 78 | 4.76 | 5.3581 | 5.184 | 0.12217 | 0.702 | 0.19211 | 0.018011 | 10.667 | 0.10506 | 0.08705 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 4.83 | 5.358 | 5.184 | 0.12272 | 0.705 | 0.19143 | 0.017455 | 10.967 | 0.10444 | 0.086987 |
| 80 | 4.90 | 5.3584 | 5.184 | 0.12328 | 0.707 | 0.19132 | 0.0169 | 11.321 | 0.10411 | 0.087211 |
| 81 | 4.97 | 5.3589 | 5.184 | 0.12383 | 0.708 | 0.19121 | 0.016345 | 11.699 | 0.10378 | 0.087434 |
| 82 | 5.04 | 5.3587 | 5.184 | 0.12439 | 0.712 | 0.19053 | 0.015789 | 12.067 | 0.10316 | 0.087369 |
| 83 | 5.11 | 5.3609 | 5.184 | 0.12494 | 0.706 | 0.19215 | 0.015234 | 12.613 | 0.10369 | 0.088458 |
| 84 | 5.18 | 5.3619 | 5.184 | 0.12494 | 0.702 | 0.19317 | 0.015234 | 12.680 | 0.1042 | 0.088969 |
| 85 | 5.25 | 5.363 | 5.184 | 0.1255 | 0.701 | 0.19363 | 0.014679 | 13.191 | 0.10416 | 0.089478 |
| 86 | 5.32 | 5.3622 | 5.184 | 0.12605 | 0.707 | 0.19237 | 0.014123 | 13.621 | 0.10325 | 0.089123 |
| [illegible] | 5.39 | 5.3627 | 5.184 | 0.12661 | 0.709 | 0.19226 | 0.013568 | 14.170 | 0.10291 | 0.089345 |
| [illegible] | 5.46 | 5.3626 | 5.184 | 0.12661 | 0.709 | 0.19213 | 0.013568 | 14.160 | 0.10285 | 0.089279 |
| [illegible] | 5.53 | 5.3607 | 5.184 | 0.12716 | 0.720 | 0.18972 | 0.013013 | 14.579 | 0.10137 | 0.088352 |
| 90 | 5.60 | 5.3617 | 5.184 | 0.12716 | 0.716 | 0.19073 | 0.013013 | 14.657 | 0.10187 | 0.088861 |
| 91 | 5.67 | 5.3622 | 5.184 | 0.12772 | 0.717 | 0.19062 | 0.012458 | 15.301 | 0.10154 | 0.089079 |
| 92 | 5.74 | 5.3626 | 5.184 | 0.12828 | 0.718 | 0.19051 | 0.011902 | 16.006 | 0.1012 | 0.089301 |
| 93 | 5.81 | 5.3608 | 5.184 | 0.12828 | 0.726 | 0.18865 | 0.011902 | 15.850 | 0.10028 | 0.088376 |
| 94 | 5.88 | 5.3601 | 5.184 | 0.12828 | 0.729 | 0.18795 | 0.011902 | 15.791 | 0.099928 | 0.088025 |
| 95 | 5.95 | 5.3599 | 5.184 | 0.12883 | 0.732 | 0.18727 | 0.011347 | 16.504 | 0.099308 | 0.087961 |
| 96 | 6.02 | 5.3598 | 5.184 | 0.12883 | 0.733 | 0.18714 | 0.011347 | 16.492 | 0.099241 | 0.087894 |
| 97 | 6.09 | 5.3585 | 5.184 | 0.12883 | 0.738 | 0.18587 | 0.011347 | 16.380 | 0.098608 | 0.087261 |
| 98 | 6.16 | 5.3601 | 5.184 | 0.12883 | 0.732 | 0.18745 | 0.011347 | 16.520 | 0.099398 | 0.088051 |
| 99 | 6.23 | 5.3577 | 5.184 | 0.12939 | 0.745 | 0.18448 | 0.010792 | 17.095 | 0.097636 | 0.086844 |
| 100 | 6.30 | 5.3598 | 5.184 | 0.12939 | 0.736 | 0.18663 | 0.010792 | 17.294 | 0.09871 | 0.087918 |
| 101 | 6.37 | 5.3597 | 5.184 | 0.12939 | 0.736 | 0.1865 | 0.010792 | 17.282 | 0.098645 | 0.087853 |
| 102 | 6.44 | 5.3573 | 5.184 | 0.12939 | 0.747 | 0.18409 | 0.010792 | 17.059 | 0.097442 | 0.08665 |
| 103 | 6.51 | 5.3572 | 5.184 | 0.12939 | 0.747 | 0.18396 | 0.010792 | 17.047 | 0.097377 | 0.086586 |
| 104 | 6.57 | 5.3559 | 5.184 | 0.12994 | 0.756 | 0.18216 | 0.010236 | 17.795 | 0.096198 | 0.085961 |

# TRIAXIAL TEST

Project: RICO-ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 10/31/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Re[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

Spe[illegible]men Height: 5.39 in
Specimen Area: 6.72 in^2
Specimen Volume: 592.86 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 77

Plastic Limit: 74

Measured Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.7169 | 0 | 0 | 5.0438 | 5.8392 | 5.8392 |
| 2 | 2.0041 | 0.020225 | 6.7182 | 5.2406 | 0.056164 | 5.076 | 5.8392 | 5.8954 |
| 3 | 4.0041 | 0.050562 | 6.7203 | 4.8171 | 0.05161 | 5.0766 | 5.8392 | 5.8908 |
| 4 | 6.0041 | 0.080899 | 6.7223 | 4.7113 | 0.050461 | 5.0771 | 5.8392 | 5.8897 |
| 5 | 8.0041 | 0.11124 | 6.7243 | 7.4639 | 0.079919 | 5.101 | 5.8392 | 5.9191 |
| 6 | 10.004 | 0.14157 | 6.7264 | 7.411 | 0.079328 | 5.0988 | 5.8392 | 5.9185 |
| 7 | 12.004 | 0.1736 | 6.7285 | 6.9875 | 0.074771 | 5.0955 | 5.8392 | 5.914 |
| 8 | 14.004 | 0.20393 | 6.7306 | 6.4052 | 0.068519 | 5.0927 | 5.8392 | 5.9077 |
| 9 | 16.004 | 0.23427 | 6.7326 | 5.5582 | 0.059441 | 5.0855 | 5.8392 | 5.8986 |
| 10 | 18.004 | 0.26461 | 6.7347 | 8.5756 | 0.091681 | 5.1116 | 5.8392 | 5.9309 |
| 11 | 20 | 0.29494 | 6.7367 | 7.6227 | 0.081469 | 5.1055 | 5.8392 | 5.9207 |
| 12 | 22 | 0.32697 | 6.7389 | 6.4052 | 0.068435 | 5.0949 | 5.8392 | 5.9076 |
| 13 | 24 | 0.3573 | 6.7409 | 9.2637 | 0.098946 | 5.1199 | 5.8392 | 5.9381 |
| 14 | 26 | 0.38764 | 6.743 | 7.9403 | 0.084785 | 5.1082 | 5.8392 | 5.924 |
| 15 | 28 | 0.41798 | 6.7451 | 10.64 | 0.11358 | 5.1299 | 5.8392 | 5.9528 |
| 16 | 30 | 0.44663 | 6.747 | 8.9461 | 0.095468 | 5.1138 | 5.8392 | 5.9347 |
| 17 | 35 | 0.52416 | 6.7523 | 11.011 | 0.11741 | 5.1327 | 5.8392 | 5.9566 |
| 18 | 40 | 0.6 | 6.7574 | 13.075 | 0.13931 | 5.1471 | 5.8392 | 5.9785 |
| 19 | 45 | 0.67753 | 6.7627 | 15.51 | 0.16513 | 5.1688 | 5.8392 | 6.0043 |
| 20 | 50.001 | 0.75337 | 6.7678 | 19.692 | 0.20949 | 5.2071 | 5.8392 | 6.0487 |
| 21 | 55.001 | 0.82921 | 6.773 | 23.186 | 0.24647 | 5.2421 | 5.8392 | 6.0857 |
| 22 | 60.001 | 0.90506 | 6.7782 | 26.362 | 0.28002 | 5.2737 | 5.8392 | 6.1192 |
| 23 | 65 | 0.98258 | 6.7835 | 28.903 | 0.30677 | 5.2998 | 5.8392 | 6.146 |
| 24 | 70 | 1.0601 | 6.7888 | 31.073 | 0.32955 | 5.327 | 5.8392 | 6.1688 |
| 25 | 75 | 1.1376 | 6.7942 | 32.873 | 0.34837 | 5.3515 | 5.8392 | 6.1876 |
| 26 | 80 | 1.2135 | 6.7994 | 34.302 | 0.36323 | 5.3737 | 5.8392 | 6.2024 |
| 27 | 85.001 | 1.291 | 6.8047 | 35.732 | 0.37807 | 5.3937 | 5.8392 | 6.2173 |
| 28 | 90.001 | 1.3685 | 6.8101 | 37.108 | 0.39233 | 5.4109 | 5.8392 | 6.2315 |
| 29 | 95.001 | 1.4427 | 6.8152 | 38.061 | 0.4021 | 5.4264 | 5.8392 | 6.2413 |
| [illegible] | 100 | 1.5219 | 6.8207 | 39.119 | 0.41295 | 5.4436 | 5.8392 | 6.2522 |
| [illegible] | 105 | 1.5994 | 6.826 | 39.966 | 0.42156 | 5.4586 | 5.8392 | 6.2608 |
| 32 | 110 | 1.6753 | 6.8313 | 40.496 | 0.42681 | 5.472 | 5.8392 | 6.266 |
| 33 | 115 | 1.7511 | 6.8366 | 41.29 | 0.43485 | 5.4847 | 5.8392 | 6.274 |
| 34 | 120 | 1.8287 | 6.842 | 41.872 | 0.44063 | 5.4931 | 5.8392 | 6.2798 |
| 35 | 125 | 1.9028 | 6.8471 | 42.454 | 0.44642 | 5.5053 | 5.8392 | 6.2856 |
| 36 | 130 | 1.9803 | 6.8526 | 43.037 | 0.45219 | 5.5164 | 5.8392 | 6.2914 |
| 37 | 135 | 2.0579 | 6.858 | 43.566 | 0.45739 | 5.5264 | 5.8392 | 6.2966 |
| 38 | 140 | 2.1337 | 6.8633 | 43.989 | 0.46148 | 5.5353 | 5.8392 | 6.3007 |
| 39 | 145 | 2.2096 | 6.8686 | 44.413 | 0.46556 | 5.5425 | 5.8392 | 6.3048 |
| 40 | 150 | 2.2854 | 6.874 | 44.678 | 0.46797 | 5.5491 | 5.8392 | 6.3072 |
| 41 | 155 | 2.3629 | 6.8794 | 44.995 | 0.47092 | 5.5575 | 5.8392 | 6.3101 |
| 42 | 160 | 2.4388 | 6.8848 | 45.366 | 0.47443 | 5.5658 | 5.8392 | 6.3136 |
| 43 | 165 | 2.5146 | 6.8901 | 45.683 | 0.47738 | 5.5725 | 5.8392 | 6.3166 |
| 44 | 170 | 2.5921 | 6.8956 | 46.054 | 0.48087 | 5.5791 | 5.8392 | 6.3201 |
| 45 | 175 | 2.668 | 6.901 | 46.319 | 0.48326 | 5.5814 | 5.8392 | 6.3225 |
| 46 | 180 | 2.7438 | 6.9064 | 46.53 | 0.48509 | 5.5886 | 5.8392 | 6.3243 |
| 47 | 185 | 2.8197 | 6.9117 | 46.636 | 0.48581 | 5.5947 | 5.8392 | 6.325 |
| 48 | 190 | 2.8972 | 6.9173 | 46.848 | 0.48763 | 5.6002 | 5.8392 | 6.3268 |
| 49 | 195 | 2.9747 | 6.9228 | 47.007 | 0.48889 | 5.6052 | 5.8392 | 6.3281 |
| 50 | 200 | 3.0539 | 6.9284 | 47.271 | 0.49124 | 5.608 | 5.8392 | 6.3304 |
| 51 | 205 | 3.1315 | 6.934 | 47.324 | 0.4914 | 5.6119 | 5.8392 | 6.3306 |
| 52 | 210 | 3.2073 | 6.9394 | 47.642 | 0.49431 | 5.6169 | 5.8392 | 6.3335 |
| 53 | 215 | 3.2882 | 6.9452 | 47.854 | 0.49609 | 5.6213 | 5.8392 | 6.3353 |
| 54 | 220 | 3.364 | 6.9507 | 47.907 | 0.49625 | 5.6252 | 5.8392 | 6.3355 |
| 55 | 225 | 3.4416 | 6.9563 | 48.171 | 0.49859 | 5.6291 | 5.8392 | 6.3378 |
| 56 | 230 | 3.5208 | 6.962 | 48.277 | 0.49928 | 5.6291 | 5.8392 | 6.3385 |
| 57 | 235 | 3.5966 | 6.9675 | 48.383 | 0.49998 | 5.6341 | 5.8392 | 6.3392 |
| 58 | 240 | 3.6742 | 6.9731 | 48.489 | 0.50067 | 5.6374 | 5.8392 | 6.3399 |
| 59 | 245 | 3.7517 | 6.9787 | 48.754 | 0.503 | 5.6408 | 5.8392 | 6.3422 |
| 60 | 250 | 3.8292 | 6.9843 | 49.071 | 0.50587 | 5.6441 | 5.8392 | 6.3451 |
| 61 | 255 | 3.9067 | 6.9899 | 49.23 | 0.5071 | 5.6441 | 5.8392 | 6.3463 |
| 62 | 260 | 3.9843 | 6.9956 | 49.23 | 0.50669 | 5.6474 | 5.8392 | 6.3459 |
| 63 | 265 | 4.0601 | 7.0011 | 49.548 | 0.50955 | 5.6502 | 5.8392 | 6.3488 |
| 64 | 270 | 4.1376 | 7.0068 | 49.865 | 0.5124 | 5.653 | 5.8392 | 6.3516 |
| 65 | 275 | 4.2118 | 7.0122 | 50.395 | 0.51744 | 5.6552 | 5.8392 | 6.3566 |
| 66 | 280 | 4.291 | 7.018 | 50.924 | 0.52245 | 5.658 | 5.8392 | 6.3616 |
| 67 | 285 | 4.3669 | 7.0236 | 51.189 | 0.52475 | 5.6602 | 5.8392 | 6.3639 |
| 68 | 290 | 4.4444 | 7.0293 | 51.4 | 0.52649 | 5.6619 | 5.8392 | 6.3657 |
| 69 | 295 | 4.5202 | 7.0349 | 51.665 | 0.52878 | 5.663 | 5.8392 | 6.368 |
| 70 | 300 | 4.5978 | 7.0406 | 52.089 | 0.53268 | 5.663 | 5.8392 | 6.3719 |
| [illegible] | 305 | 4.6736 | 7.0462 | 52.353 | 0.53496 | 5.6641 | 5.8392 | 6.3742 |
| [illegible] | 310 | 4.7478 | 7.0517 | 52.936 | 0.54049 | 5.6663 | 5.8392 | 6.3797 |
| 73 | 315 | 4.8236 | 7.0573 | 53.359 | 0.54438 | 5.668 | 5.8392 | 6.3836 |
| 74 | 320 | 4.8994 | 7.0629 | 53.836 | 0.54881 | 5.6696 | 5.8392 | 6.388 |
| 75 | 325 | 4.9753 | 7.0685 | 54.312 | 0.55322 | 5.6708 | 5.8392 | 6.3924 |
| 76 | 330 | 5.0511 | 7.0742 | 54.735 | 0.55709 | 5.6719 | 5.8392 | 6.3963 |
| 77 | 335 | 5.1253 | 7.0797 | 55 | 0.55935 | 5.673 | 5.8392 | 6.3985 |
| 78 | 340 | 5.2011 | 7.0854 | 55 | 0.5589 | 5.6735 | 5.8392 | 6.3981 |
| 79 | 344.9 | 5.2753 | 7.0909 | 54.894 | 0.55739 | 5.6719 | 5.8392 | 6.3966 |

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO-ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 10/31/11 | Depth: 12.0"-42.0" |
| Test No.: 11.1 PSI | Sample Type: 3 " ST | Elevation: ---- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
R[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

| | | |
|---|---|---|
| Sp[illegible]men Height: 5.39 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.72 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 592.86 cc | Piston Weight: 0.00 lb | Correction Type: Uniform |
| Liquid Limit: 77 | Plastic Limit: 74 | Measured Specific Gravity: 2.99 |

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.8392 | 5.8392 | 0 | 0.000 | 0.79538 | 0.79538 | 1.000 | 0.79538 | 0 |
| 2 | 0.02 | 5.8954 | 5.8392 | 0.032208 | 0.573 | 0.81933 | 0.76317 | 1.074 | 0.79125 | 0.028082 |
| 3 | 0.05 | 5.8908 | 5.8392 | 0.032763 | 0.635 | 0.81422 | 0.76261 | 1.068 | 0.78842 | 0.025805 |
| 4 | 0.08 | 5.8897 | 5.8392 | 0.033318 | 0.660 | 0.81252 | 0.76206 | 1.066 | 0.78729 | 0.02523 |
| 5 | 0.11 | 5.9191 | 5.8392 | 0.057196 | 0.716 | 0.8181 | 0.73818 | 1.108 | 0.77814 | 0.039959 |
| 6 | 0.14 | 5.9185 | 5.8392 | 0.054975 | 0.693 | 0.81973 | 0.7404 | 1.107 | 0.78007 | 0.039664 |
| 7 | 0.17 | 5.914 | 5.8392 | 0.051643 | 0.691 | 0.81851 | 0.74373 | 1.101 | 0.78112 | 0.037386 |
| 8 | 0.20 | 5.9077 | 5.8392 | 0.048867 | 0.713 | 0.81503 | 0.74651 | 1.092 | 0.78077 | 0.03426 |
| 9 | 0.23 | 5.8986 | 5.8392 | 0.041648 | 0.701 | 0.81317 | 0.75373 | 1.079 | 0.78345 | 0.02972 |
| 10 | 0.26 | 5.9309 | 5.8392 | 0.067747 | 0.739 | 0.81931 | 0.72763 | 1.126 | 0.77347 | 0.04584 |
| 11 | 0.29 | 5.9207 | 5.8392 | 0.061639 | 0.757 | 0.81521 | 0.73374 | 1.111 | 0.77447 | 0.040735 |
| 12 | 0.33 | 5.9076 | 5.8392 | 0.051088 | 0.747 | 0.81272 | 0.74429 | 1.092 | 0.77851 | 0.034217 |
| 13 | 0.36 | 5.9381 | 5.8392 | 0.076077 | 0.769 | 0.81825 | 0.7193 | 1.138 | 0.76877 | 0.049473 |
| 14 | 0.39 | 5.924 | 5.8392 | 0.064415 | 0.760 | 0.81575 | 0.73096 | 1.116 | 0.77335 | 0.042392 |
| 15 | 0.42 | 5.9528 | 5.8392 | 0.086072 | 0.758 | 0.82288 | 0.70931 | 1.160 | 0.76609 | 0.056789 |
| 16 | 0.45 | 5.9347 | 5.8392 | 0.069968 | 0.733 | 0.82088 | 0.72541 | 1.132 | 0.77314 | 0.047734 |
| 17 | 0.52 | 5.9566 | 5.8392 | 0.088849 | 0.757 | 0.82394 | 0.70653 | 1.166 | 0.76523 | 0.058704 |
| 18 | 0.60 | 5.9785 | 5.8392 | 0.10329 | 0.741 | 0.83141 | 0.69209 | 1.201 | 0.76175 | 0.069657 |
| 19 | 0.68 | 6.0043 | 5.8392 | 0.12494 | 0.757 | 0.83557 | 0.67043 | 1.246 | 0.753 | 0.082566 |
| 20 | 0.75 | 6.0487 | 5.8392 | 0.16326 | 0.779 | 0.84161 | 0.63212 | 1.331 | 0.73687 | 0.10475 |
| 21 | 0.83 | 6.0857 | 5.8392 | 0.19824 | 0.804 | 0.84361 | 0.59713 | 1.413 | 0.72037 | 0.12324 |
| 22 | 0.91 | 6.1192 | 5.8392 | 0.2299 | 0.821 | 0.84551 | 0.56548 | 1.495 | 0.70549 | 0.14001 |
| 23 | 0.98 | 6.146 | 5.8392 | 0.25599 | 0.834 | 0.84616 | 0.53938 | 1.569 | 0.69277 | 0.15339 |
| 24 | 1.06 | 6.1688 | 5.8392 | 0.2832 | 0.859 | 0.84172 | 0.51217 | 1.643 | 0.67695 | 0.16478 |
| 25 | 1.14 | 6.1876 | 5.8392 | 0.30764 | 0.883 | 0.83611 | 0.48774 | 1.714 | 0.66192 | 0.17418 |
| 26 | 1.21 | 6.2024 | 5.8392 | 0.32985 | 0.908 | 0.82876 | 0.46553 | 1.780 | 0.64714 | 0.18162 |
| 27 | 1.29 | 6.2173 | 5.8392 | 0.34984 | 0.925 | 0.82361 | 0.44554 | 1.849 | 0.63457 | 0.18904 |
| 28 | 1.37 | 6.2315 | 5.8392 | 0.36706 | 0.936 | 0.82065 | 0.42832 | 1.916 | 0.62448 | 0.19616 |
| [illegible] | 1.44 | 6.2413 | 5.8392 | 0.3826 | 0.952 | 0.81487 | 0.41277 | 1.974 | 0.61382 | 0.20105 |
| [illegible] | 1.52 | 6.2522 | 5.8392 | 0.39982 | 0.968 | 0.80851 | 0.39556 | 2.044 | 0.60203 | 0.20648 |
| 31 | 1.60 | 6.2608 | 5.8392 | 0.41481 | 0.984 | 0.80212 | 0.38057 | 2.108 | 0.59135 | 0.21078 |
| 32 | 1.68 | 6.266 | 5.8392 | 0.42814 | 1.003 | 0.79405 | 0.36724 | 2.162 | 0.58065 | 0.21341 |
| 33 | 1.75 | 6.274 | 5.8392 | 0.44091 | 1.014 | 0.78931 | 0.35447 | 2.227 | 0.57189 | 0.21742 |
| 34 | 1.83 | 6.2798 | 5.8392 | 0.44924 | 1.020 | 0.78677 | 0.34614 | 2.273 | 0.56645 | 0.22032 |
| 35 | 1.90 | 6.2856 | 5.8392 | 0.46146 | 1.034 | 0.78034 | 0.33392 | 2.337 | 0.55713 | 0.22321 |
| 36 | 1.98 | 6.2914 | 5.8392 | 0.47256 | 1.045 | 0.775 | 0.32281 | 2.401 | 0.54891 | 0.22609 |
| 37 | 2.06 | 6.2966 | 5.8392 | 0.48256 | 1.055 | 0.77021 | 0.31282 | 2.462 | 0.54151 | 0.22869 |
| 38 | 2.13 | 6.3007 | 5.8392 | 0.49144 | 1.065 | 0.76541 | 0.30393 | 2.518 | 0.53467 | 0.23074 |
| 39 | 2.21 | 6.3048 | 5.8392 | 0.49866 | 1.071 | 0.76227 | 0.29671 | 2.569 | 0.52949 | 0.23278 |
| 40 | 2.29 | 6.3072 | 5.8392 | 0.50533 | 1.080 | 0.75802 | 0.29005 | 2.613 | 0.52404 | 0.23398 |
| 41 | 2.36 | 6.3101 | 5.8392 | 0.51366 | 1.091 | 0.75264 | 0.28172 | 2.672 | 0.51718 | 0.23546 |
| 42 | 2.44 | 6.3136 | 5.8392 | 0.52199 | 1.100 | 0.74782 | 0.27339 | 2.735 | 0.51061 | 0.23722 |
| 43 | 2.51 | 6.3166 | 5.8392 | 0.52865 | 1.107 | 0.74411 | 0.26673 | 2.790 | 0.50542 | 0.23869 |
| 44 | 2.59 | 6.3201 | 5.8392 | 0.53531 | 1.113 | 0.74093 | 0.26006 | 2.849 | 0.5005 | 0.24043 |
| 45 | 2.67 | 6.3225 | 5.8392 | 0.53753 | 1.112 | 0.7411 | 0.25784 | 2.874 | 0.49947 | 0.24163 |
| 46 | 2.74 | 6.3243 | 5.8392 | 0.54475 | 1.123 | 0.73571 | 0.25062 | 2.936 | 0.49317 | 0.24254 |
| 47 | 2.82 | 6.325 | 5.8392 | 0.55086 | 1.134 | 0.73033 | 0.24452 | 2.987 | 0.48742 | 0.24291 |
| 48 | 2.90 | 6.3268 | 5.8392 | 0.55641 | 1.141 | 0.72659 | 0.23896 | 3.041 | 0.48278 | 0.24381 |
| 49 | 2.97 | 6.3281 | 5.8392 | 0.56141 | 1.148 | 0.72286 | 0.23397 | 3.090 | 0.47841 | 0.24445 |
| 50 | 3.05 | 6.3304 | 5.8392 | 0.56419 | 1.148 | 0.72243 | 0.23119 | 3.125 | 0.47681 | 0.24562 |
| 51 | 3.13 | 6.3306 | 5.8392 | 0.56808 | 1.156 | 0.7187 | 0.2273 | 3.162 | 0.473 | 0.2457 |
| 52 | 3.21 | 6.3335 | 5.8392 | 0.57307 | 1.159 | 0.71661 | 0.2223 | 3.224 | 0.46946 | 0.24715 |
| 53 | 3.29 | 6.3353 | 5.8392 | 0.57752 | 1.164 | 0.71395 | 0.21786 | 3.277 | 0.46591 | 0.24805 |
| 54 | 3.36 | 6.3355 | 5.8392 | 0.5814 | 1.172 | 0.71023 | 0.21397 | 3.319 | 0.4621 | 0.24813 |
| 55 | 3.44 | 6.3378 | 5.8392 | 0.58529 | 1.174 | 0.70868 | 0.21009 | 3.373 | 0.45938 | 0.2493 |
| 56 | 3.52 | 6.3385 | 5.8392 | 0.58529 | 1.172 | 0.70937 | 0.21009 | 3.377 | 0.45973 | 0.24964 |
| 57 | 3.60 | 6.3392 | 5.8392 | 0.59029 | 1.181 | 0.70507 | 0.20509 | 3.438 | 0.45508 | 0.24999 |
| 58 | 3.67 | 6.3399 | 5.8392 | 0.59362 | 1.186 | 0.70243 | 0.20176 | 3.482 | 0.45209 | 0.25034 |
| 59 | 3.75 | 6.3422 | 5.8392 | 0.59695 | 1.187 | 0.70142 | 0.19843 | 3.535 | 0.44993 | 0.2515 |
| 60 | 3.83 | 6.3451 | 5.8392 | 0.60028 | 1.187 | 0.70096 | 0.19509 | 3.593 | 0.44803 | 0.25293 |
| 61 | 3.91 | 6.3463 | 5.8392 | 0.60028 | 1.184 | 0.70219 | 0.19509 | 3.599 | 0.44864 | 0.25355 |
| 62 | 3.98 | 6.3459 | 5.8392 | 0.60362 | 1.191 | 0.69845 | 0.19176 | 3.642 | 0.44511 | 0.25334 |
| 63 | 4.06 | 6.3488 | 5.8392 | 0.60639 | 1.190 | 0.69854 | 0.18899 | 3.696 | 0.44376 | 0.25478 |
| 64 | 4.14 | 6.3516 | 5.8392 | 0.60917 | 1.189 | 0.69861 | 0.18621 | 3.752 | 0.44241 | 0.2562 |
| 65 | 4.21 | 6.3566 | 5.8392 | 0.61139 | 1.182 | 0.70143 | 0.18399 | 3.812 | 0.44271 | 0.25872 |
| 66 | 4.29 | 6.3616 | 5.8392 | 0.61417 | 1.176 | 0.70366 | 0.18121 | 3.883 | 0.44243 | 0.26122 |
| 67 | 4.37 | 6.3639 | 5.8392 | 0.61639 | 1.175 | 0.70374 | 0.17899 | 3.932 | 0.44136 | 0.26237 |
| 68 | 4.44 | 6.3657 | 5.8392 | 0.61805 | 1.174 | 0.70381 | 0.17732 | 3.969 | 0.44057 | 0.26324 |
| 69 | 4.52 | 6.368 | 5.8392 | 0.61916 | 1.171 | 0.70499 | 0.17621 | 4.001 | 0.4406 | 0.26439 |
| [illegible] | 4.60 | 6.3719 | 5.8392 | 0.61916 | 1.162 | 0.7089 | 0.17621 | 4.023 | 0.44255 | 0.26634 |
| [illegible] | 4.67 | 6.3742 | 5.8392 | 0.62027 | 1.159 | 0.71007 | 0.1751 | 4.055 | 0.44258 | 0.26748 |
| 72 | 4.75 | 6.3797 | 5.8392 | 0.6225 | 1.152 | 0.71337 | 0.17288 | 4.126 | 0.44313 | 0.27025 |
| 73 | 4.82 | 6.3836 | 5.8392 | 0.62416 | 1.147 | 0.7156 | 0.17122 | 4.180 | 0.44341 | 0.27219 |
| 74 | 4.90 | 6.388 | 5.8392 | 0.62583 | 1.140 | 0.71836 | 0.16955 | 4.237 | 0.44395 | 0.2744 |
| 75 | 4.98 | 6.3924 | 5.8392 | 0.62694 | 1.133 | 0.72166 | 0.16844 | 4.284 | 0.44505 | 0.27661 |
| 76 | 5.05 | 6.3963 | 5.8392 | 0.62805 | 1.127 | 0.72442 | 0.16733 | 4.329 | 0.44587 | 0.27854 |
| 77 | 5.13 | 6.3985 | 5.8392 | 0.62916 | 1.125 | 0.72556 | 0.16622 | 4.365 | 0.44589 | 0.27967 |
| 78 | 5.20 | 6.3981 | 5.8392 | 0.62971 | 1.127 | 0.72456 | 0.16566 | 4.374 | 0.44511 | 0.27945 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 5.28 | 6.3966 | 5.8392 | 0.62805 | 1.127 | 0.72472 | 0.16733 | 4.331 | 0.44602 | 0.27869 |

# TRIAXIAL TEST

AECOM

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: STAGE 3
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/1/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 4.69 in
Specimen Area: 7.00 in^2
Specimen Volume: 537.97 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 77

Plastic Limit: 74

Measured Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 7.002 | 0 | 0 | 5.0399 | 7.0488 | 7.0488 |
| 2 | 5.0001 | 0.032915 | 7.0043 | 7.411 | 0.076181 | 5.1588 | 7.0488 | 7.125 |
| 3 | 10.004 | 0.083255 | 7.0078 | 14.187 | 0.14576 | 5.2471 | 7.0488 | 7.1946 |
| 4 | 15.004 | 0.13553 | 7.0115 | 19.851 | 0.20385 | 5.3243 | 7.0488 | 7.2526 |
| 5 | 20.004 | 0.18587 | 7.015 | 24.933 | 0.2559 | 5.3959 | 7.0488 | 7.3047 |
| 6 | 25.004 | 0.23621 | 7.0185 | 29.22 | 0.29976 | 5.4625 | 7.0488 | 7.3486 |
| 7 | 30 | 0.28849 | 7.0222 | 33.191 | 0.34031 | 5.5247 | 7.0488 | 7.3891 |
| 8 | 35 | 0.33883 | 7.0258 | 36.896 | 0.37811 | 5.5825 | 7.0488 | 7.4269 |
| 9 | 40 | 0.39111 | 7.0294 | 40.125 | 0.41099 | 5.6324 | 7.0488 | 7.4598 |
| 10 | 45 | 0.44338 | 7.0331 | 43.09 | 0.44112 | 5.6846 | 7.0488 | 7.4899 |
| 11 | 50 | 0.49566 | 7.0368 | 45.842 | 0.46905 | 5.733 | 7.0488 | 7.5179 |
| 12 | 55 | 0.54794 | 7.0405 | 48.33 | 0.49425 | 5.7779 | 7.0488 | 7.543 |
| 13 | 60 | 0.60021 | 7.0442 | 50.395 | 0.51509 | 5.8201 | 7.0488 | 7.5639 |
| 14 | 70 | 0.70477 | 7.0516 | 54.577 | 0.55725 | 5.8962 | 7.0488 | 7.606 |
| 15 | 80 | 0.81126 | 7.0592 | 58.441 | 0.59606 | 5.9606 | 7.0488 | 7.6449 |
| 16 | 90.001 | 0.91581 | 7.0667 | 61.511 | 0.62672 | 6.0223 | 7.0488 | 7.6755 |
| 17 | 100 | 1.0204 | 7.0741 | 64.158 | 0.65299 | 6.0767 | 7.0488 | 7.7018 |
| 18 | 110 | 1.1249 | 7.0816 | 66.381 | 0.67491 | 6.125 | 7.0488 | 7.7237 |
| 19 | 120 | 1.2314 | 7.0892 | 68.499 | 0.69569 | 6.1655 | 7.0488 | 7.7445 |
| 20 | 130 | 1.336 | 7.0968 | 70.351 | 0.71375 | 6.2061 | 7.0488 | 7.7625 |
| 21 | 140 | 1.4405 | 7.1043 | 71.939 | 0.72909 | 6.2427 | 7.0488 | 7.7779 |
| 22 | 150 | 1.5489 | 7.1121 | 73.528 | 0.74436 | 6.2755 | 7.0488 | 7.7932 |
| 23 | 160 | 1.6554 | 7.1198 | 75.01 | 0.75855 | 6.3021 | 7.0488 | 7.8073 |
| 24 | 170 | 1.7619 | 7.1275 | 76.121 | 0.76895 | 6.3305 | 7.0488 | 7.8178 |
| 25 | 180 | 1.8684 | 7.1353 | 77.021 | 0.7772 | 6.3554 | 7.0488 | 7.826 |
| 26 | 190 | 1.9749 | 7.143 | 78.451 | 0.79076 | 6.376 | 7.0488 | 7.8396 |
| 27 | 200 | 2.0814 | 7.1508 | 79.562 | 0.8011 | 6.3971 | 7.0488 | 7.8499 |
| 28 | 210 | 2.1879 | 7.1586 | 80.092 | 0.80555 | 6.4176 | 7.0488 | 7.8544 |
| 29 | 220 | 2.2944 | 7.1664 | 81.15 | 0.81531 | 6.4354 | 7.0488 | 7.8641 |
| [illegible] | 230 | 2.3989 | 7.1741 | 81.68 | 0.81975 | 6.4487 | 7.0488 | 7.8686 |
| [illegible] | 240 | 2.5073 | 7.182 | 82.209 | 0.82415 | 6.466 | 7.0488 | 7.8729 |
| 32 | 270 | 2.8249 | 7.2055 | 83.956 | 0.83892 | 6.502 | 7.0488 | 7.8877 |
| 33 | 300 | 3.1405 | 7.229 | 84.962 | 0.84621 | 6.5376 | 7.0488 | 7.895 |
| 34 | 330 | 3.4561 | 7.2526 | 85.491 | 0.84871 | 6.562 | 7.0488 | 7.8975 |
| 35 | 360 | 3.7736 | 7.2765 | 85.173 | 0.84277 | 6.5803 | 7.0488 | 7.8916 |
| 36 | 390 | 4.0873 | 7.3003 | 83.797 | 0.82645 | 6.5931 | 7.0488 | 7.8753 |
| 37 | 420 | 4.399 | 7.3241 | 82.103 | 0.80712 | 6.6103 | 7.0488 | 7.8559 |
| 38 | 450 | 4.7165 | 7.3485 | 80.674 | 0.79043 | 6.6203 | 7.0488 | 7.8392 |
| 39 | 480 | 5.0321 | 7.373 | 80.092 | 0.78213 | 6.6309 | 7.0488 | 7.8309 |
| 40 | 510 | 5.3516 | 7.3979 | 79.721 | 0.77589 | 6.6398 | 7.0488 | 7.8247 |
| 41 | 540 | 5.673 | 7.4231 | 79.35 | 0.76966 | 6.6442 | 7.0488 | 7.8185 |
| 42 | 570 | 5.9905 | 7.4481 | 79.456 | 0.76809 | 6.6542 | 7.0488 | 7.8169 |
| 43 | 600 | 6.3061 | 7.4732 | 79.192 | 0.76296 | 6.6592 | 7.0488 | 7.8118 |
| 44 | 630 | 6.6236 | 7.4986 | 79.509 | 0.76343 | 6.6631 | 7.0488 | 7.8122 |
| 45 | 660 | 6.9412 | 7.5242 | 79.615 | 0.76185 | 6.6664 | 7.0488 | 7.8106 |
| 46 | 690 | 7.2606 | 7.5501 | 79.88 | 0.76175 | 6.6698 | 7.0488 | 7.8106 |
| 47 | 720 | 7.5801 | 7.5762 | 79.192 | 0.75259 | 6.672 | 7.0488 | 7.8014 |
| 48 | 750 | 7.8996 | 7.6025 | 79.086 | 0.74899 | 6.6753 | 7.0488 | 7.7978 |
| 49 | 780 | 8.2191 | 7.629 | 78.821 | 0.74389 | 6.6775 | 7.0488 | 7.7927 |
| 50 | 810 | 8.5385 | 7.6556 | 78.08 | 0.73433 | 6.6803 | 7.0488 | 7.7831 |
| 51 | 840 | 8.8541 | 7.6821 | 77.498 | 0.72634 | 6.6825 | 7.0488 | 7.7751 |
| 52 | 870 | 9.1697 | 7.7088 | 78.027 | 0.72877 | 6.6853 | 7.0488 | 7.7776 |
| 53 | 900 | 9.4853 | 7.7357 | 77.974 | 0.72574 | 6.687 | 7.0488 | 7.7745 |
| 54 | 930 | 9.8028 | 7.7629 | 77.921 | 0.72271 | 6.6875 | 7.0488 | 7.7715 |
| 55 | 960 | 10.122 | 7.7905 | 78.027 | 0.72113 | 6.6903 | 7.0488 | 7.7699 |
| 56 | 990 | 10.438 | 7.818 | 77.974 | 0.71811 | 6.6914 | 7.0488 | 7.7669 |
| 57 | 1020 | 10.755 | 7.8458 | 78.239 | 0.71799 | 6.6925 | 7.0488 | 7.7668 |
| 58 | 1050 | 11.071 | 7.8736 | 77.498 | 0.70867 | 6.6942 | 7.0488 | 7.7575 |
| 59 | 1080 | 11.391 | 7.902 | 76.81 | 0.69986 | 6.6959 | 7.0488 | 7.7487 |
| 60 | 1110 | 11.708 | 7.9305 | 76.915 | 0.69831 | 6.6981 | 7.0488 | 7.7471 |
| 61 | 1140 | 12.022 | 7.9587 | 76.492 | 0.692 | 6.6997 | 7.0488 | 7.7408 |
| 62 | 1170 | 12.337 | 7.9874 | 75.645 | 0.68188 | 6.7014 | 7.0488 | 7.7307 |
| 63 | 1200 | 12.657 | 8.0166 | 74.48 | 0.66894 | 6.7042 | 7.0488 | 7.7177 |
| 64 | 1230 | 12.974 | 8.0458 | 73.951 | 0.66177 | 6.7058 | 7.0488 | 7.7106 |

# TRIAXIAL TEST

AECOM

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: STAGE 3
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/1/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
R[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

Sp[illegible]men Height: 4.69 in
Specimen Area: 7.00 in^2
Specimen Volume: 537.97 cc

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 77

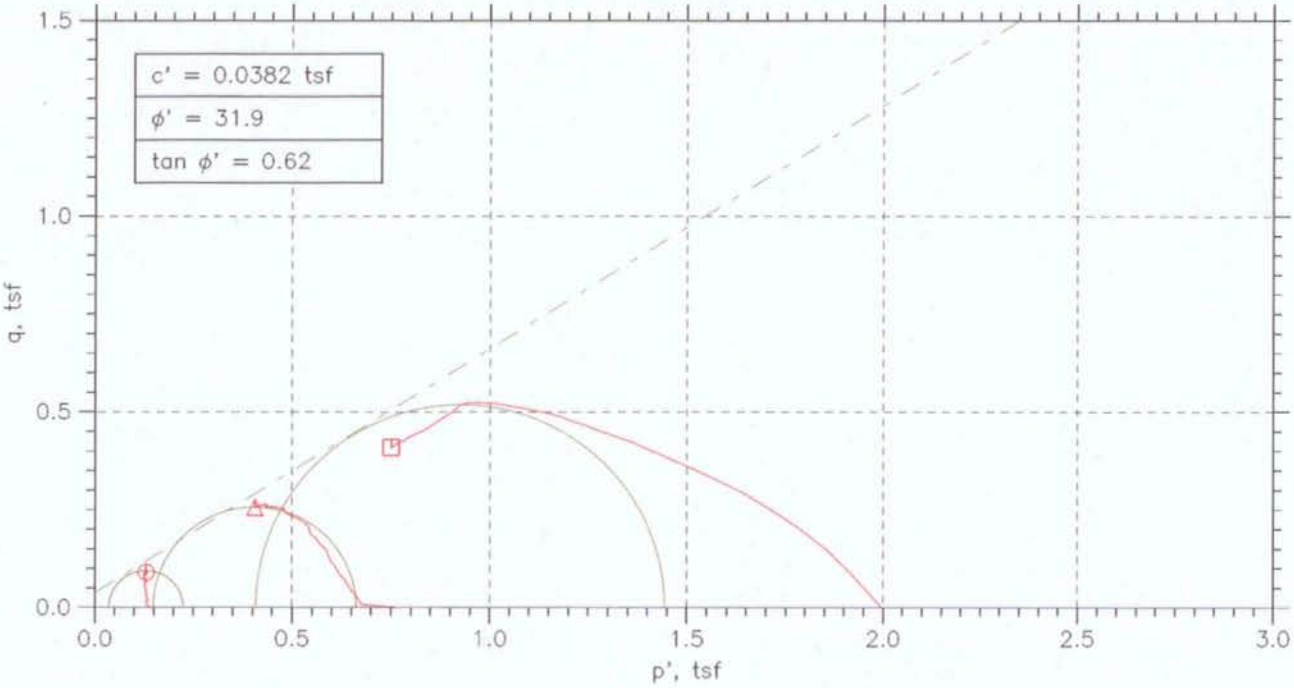
Plastic Limit: 74

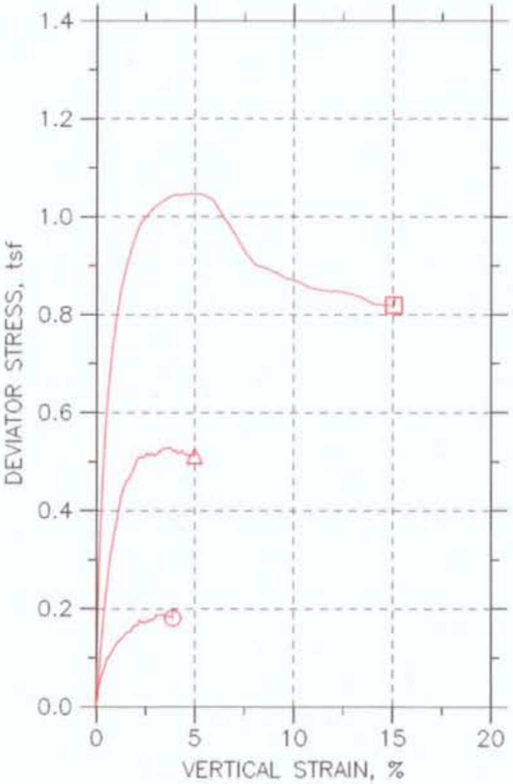
Measured Specific Gravity: 2.99

|  | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 7.0488 | 7.0488 | 0 | 0.000 | 2.0089 | 2.0089 | 1.000 | 2.0089 | 0 |
| 2 | 0.03 | 7.125 | 7.0488 | 0.11883 | 1.560 | 1.9662 | 1.89 | 1.040 | 1.9281 | 0.03809 |
| 3 | 0.08 | 7.1946 | 7.0488 | 0.20713 | 1.421 | 1.9475 | 1.8017 | 1.081 | 1.8746 | 0.072879 |
| 4 | 0.14 | 7.2526 | 7.0488 | 0.28432 | 1.395 | 1.9284 | 1.7245 | 1.118 | 1.8265 | 0.10192 |
| 5 | 0.19 | 7.3047 | 7.0488 | 0.35595 | 1.391 | 1.9088 | 1.6529 | 1.155 | 1.7809 | 0.12795 |
| 6 | 0.24 | 7.3486 | 7.0488 | 0.42259 | 1.410 | 1.886 | 1.5863 | 1.189 | 1.7362 | 0.14988 |
| 7 | 0.29 | 7.3891 | 7.0488 | 0.48478 | 1.425 | 1.8644 | 1.5241 | 1.223 | 1.6942 | 0.17015 |
| 8 | 0.34 | 7.4269 | 7.0488 | 0.54253 | 1.435 | 1.8444 | 1.4663 | 1.258 | 1.6554 | 0.18906 |
| 9 | 0.39 | 7.4598 | 7.0488 | 0.59251 | 1.442 | 1.8273 | 1.4164 | 1.290 | 1.6218 | 0.20549 |
| 10 | 0.44 | 7.4899 | 7.0488 | 0.64471 | 1.462 | 1.8053 | 1.3642 | 1.323 | 1.5847 | 0.22056 |
| 11 | 0.50 | 7.5179 | 7.0488 | 0.69302 | 1.477 | 1.7849 | 1.3158 | 1.356 | 1.5504 | 0.23453 |
| 12 | 0.55 | 7.543 | 7.0488 | 0.738 | 1.493 | 1.7651 | 1.2709 | 1.389 | 1.518 | 0.24712 |
| 13 | 0.60 | 7.5639 | 7.0488 | 0.7802 | 1.515 | 1.7438 | 1.2287 | 1.419 | 1.4862 | 0.25755 |
| 14 | 0.70 | 7.606 | 7.0488 | 0.85628 | 1.537 | 1.7098 | 1.1526 | 1.483 | 1.4312 | 0.27862 |
| 15 | 0.81 | 7.6449 | 7.0488 | 0.92069 | 1.545 | 1.6842 | 1.0882 | 1.548 | 1.3862 | 0.29803 |
| 16 | 0.92 | 7.6755 | 7.0488 | 0.98233 | 1.567 | 1.6532 | 1.0265 | 1.611 | 1.3399 | 0.31336 |
| 17 | 1.02 | 7.7018 | 7.0488 | 1.0368 | 1.588 | 1.6251 | 0.97211 | 1.672 | 1.2986 | 0.3265 |
| 18 | 1.12 | 7.7237 | 7.0488 | 1.0851 | 1.608 | 1.5987 | 0.9238 | 1.731 | 1.2613 | 0.33745 |
| 19 | 1.23 | 7.7445 | 7.0488 | 1.1256 | 1.618 | 1.579 | 0.88326 | 1.788 | 1.2311 | 0.34784 |
| 20 | 1.34 | 7.7625 | 7.0488 | 1.1661 | 1.634 | 1.5565 | 0.84273 | 1.847 | 1.1996 | 0.35687 |
| 21 | 1.44 | 7.7779 | 7.0488 | 1.2028 | 1.650 | 1.5352 | 0.80608 | 1.904 | 1.1706 | 0.36454 |
| 22 | 1.55 | 7.7932 | 7.0488 | 1.2356 | 1.660 | 1.5177 | 0.77331 | 1.963 | 1.1455 | 0.37218 |
| 23 | 1.66 | 7.8073 | 7.0488 | 1.2622 | 1.664 | 1.5052 | 0.74666 | 2.016 | 1.1259 | 0.37927 |
| 24 | 1.76 | 7.8178 | 7.0488 | 1.2905 | 1.678 | 1.4873 | 0.71834 | 2.070 | 1.1028 | 0.38448 |
| 25 | 1.87 | 7.826 | 7.0488 | 1.3155 | 1.693 | 1.4706 | 0.69335 | 2.121 | 1.082 | 0.3886 |
| 26 | 1.97 | 7.8396 | 7.0488 | 1.3361 | 1.690 | 1.4636 | 0.6728 | 2.175 | 1.0682 | 0.39538 |
| 27 | 2.08 | 7.8499 | 7.0488 | 1.3572 | 1.694 | 1.4528 | 0.6517 | 2.229 | 1.0523 | 0.40055 |
| 28 | 2.19 | 7.8544 | 7.0488 | 1.3777 | 1.710 | 1.4367 | 0.63116 | 2.276 | 1.0339 | 0.40278 |
| [illegible] | 2.29 | 7.8641 | 7.0488 | 1.3955 | 1.712 | 1.4287 | 0.61339 | 2.329 | 1.021 | 0.40766 |
| [illegible] | 2.40 | 7.8686 | 7.0488 | 1.4088 | 1.719 | 1.4198 | 0.60006 | 2.366 | 1.0099 | 0.40988 |
| 31 | 2.51 | 7.8729 | 7.0488 | 1.426 | 1.730 | 1.407 | 0.58284 | 2.414 | 0.99492 | 0.41207 |
| 32 | 2.82 | 7.8877 | 7.0488 | 1.4621 | 1.743 | 1.3857 | 0.54675 | 2.534 | 0.96621 | 0.41946 |
| 33 | 3.14 | 7.895 | 7.0488 | 1.4977 | 1.770 | 1.3574 | 0.51121 | 2.655 | 0.93432 | 0.42311 |
| 34 | 3.46 | 7.8975 | 7.0488 | 1.5221 | 1.793 | 1.3355 | 0.48678 | 2.744 | 0.91113 | 0.42435 |
| 35 | 3.77 | 7.8916 | 7.0488 | 1.5404 | 1.828 | 1.3112 | 0.46845 | 2.799 | 0.88984 | 0.42139 |
| 36 | 4.09 | 7.8753 | 7.0488 | 1.5532 | 1.879 | 1.2821 | 0.45568 | 2.814 | 0.86891 | 0.41323 |
| 37 | 4.40 | 7.8559 | 7.0488 | 1.5704 | 1.946 | 1.2456 | 0.43847 | 2.841 | 0.84202 | 0.40356 |
| 38 | 4.72 | 7.8392 | 7.0488 | 1.5804 | 1.999 | 1.2189 | 0.42847 | 2.845 | 0.82369 | 0.39522 |
| 39 | 5.03 | 7.8309 | 7.0488 | 1.5909 | 2.034 | 1.2 | 0.41792 | 2.871 | 0.80898 | 0.39106 |
| 40 | 5.35 | 7.8247 | 7.0488 | 1.5998 | 2.062 | 1.1849 | 0.40903 | 2.897 | 0.79698 | 0.38794 |
| 41 | 5.67 | 7.8185 | 7.0488 | 1.6043 | 2.084 | 1.1743 | 0.40459 | 2.902 | 0.78942 | 0.38483 |
| 42 | 5.99 | 7.8169 | 7.0488 | 1.6143 | 2.102 | 1.1627 | 0.3946 | 2.947 | 0.77864 | 0.38405 |
| 43 | 6.31 | 7.8118 | 7.0488 | 1.6193 | 2.122 | 1.1526 | 0.3896 | 2.958 | 0.77108 | 0.38148 |
| 44 | 6.62 | 7.8122 | 7.0488 | 1.6232 | 2.126 | 1.1491 | 0.38571 | 2.979 | 0.76743 | 0.38171 |
| 45 | 6.94 | 7.8106 | 7.0488 | 1.6265 | 2.135 | 1.1442 | 0.38238 | 2.992 | 0.7633 | 0.38092 |
| 46 | 7.26 | 7.8106 | 7.0488 | 1.6298 | 2.140 | 1.1408 | 0.37905 | 3.010 | 0.75993 | 0.38088 |
| 47 | 7.58 | 7.8014 | 7.0488 | 1.632 | 2.169 | 1.1294 | 0.37683 | 2.997 | 0.75312 | 0.37629 |
| 48 | 7.90 | 7.7978 | 7.0488 | 1.6354 | 2.183 | 1.1225 | 0.3735 | 3.005 | 0.74799 | 0.37449 |
| 49 | 8.22 | 7.7927 | 7.0488 | 1.6376 | 2.201 | 1.1152 | 0.37127 | 3.004 | 0.74322 | 0.37194 |
| 50 | 8.54 | 7.7831 | 7.0488 | 1.6404 | 2.234 | 1.1028 | 0.3685 | 2.993 | 0.73566 | 0.36717 |
| 51 | 8.85 | 7.7751 | 7.0488 | 1.6426 | 2.261 | 1.0926 | 0.36628 | 2.983 | 0.72945 | 0.36317 |
| 52 | 9.17 | 7.7776 | 7.0488 | 1.6454 | 2.258 | 1.0923 | 0.3635 | 3.005 | 0.72788 | 0.36438 |
| 53 | 9.49 | 7.7745 | 7.0488 | 1.647 | 2.269 | 1.0876 | 0.36183 | 3.006 | 0.72471 | 0.36287 |
| 54 | 9.80 | 7.7715 | 7.0488 | 1.6476 | 2.280 | 1.084 | 0.36128 | 3.000 | 0.72263 | 0.36135 |
| 55 | 10.12 | 7.7699 | 7.0488 | 1.6504 | 2.289 | 1.0796 | 0.3585 | 3.011 | 0.71906 | 0.36056 |
| 56 | 10.44 | 7.7669 | 7.0488 | 1.6515 | 2.300 | 1.0755 | 0.35739 | 3.009 | 0.71644 | 0.35905 |
| 57 | 10.76 | 7.7668 | 7.0488 | 1.6526 | 2.302 | 1.0743 | 0.35628 | 3.015 | 0.71528 | 0.35899 |
| 58 | 11.07 | 7.7575 | 7.0488 | 1.6542 | 2.334 | 1.0633 | 0.35462 | 2.998 | 0.70895 | 0.35434 |
| 59 | 11.39 | 7.7487 | 7.0488 | 1.6559 | 2.366 | 1.0528 | 0.35295 | 2.983 | 0.70288 | 0.34993 |
| 60 | 11.71 | 7.7471 | 7.0488 | 1.6581 | 2.375 | 1.049 | 0.35073 | 2.991 | 0.69988 | 0.34915 |
| 61 | 12.02 | 7.7408 | 7.0488 | 1.6598 | 2.399 | 1.0411 | 0.34906 | 2.982 | 0.69506 | 0.346 |
| 62 | 12.34 | 7.7307 | 7.0488 | 1.6615 | 2.437 | 1.0293 | 0.3474 | 2.963 | 0.68834 | 0.34094 |
| 63 | 12.66 | 7.7177 | 7.0488 | 1.6642 | 2.488 | 1.0136 | 0.34462 | 2.941 | 0.67909 | 0.33447 |
| 64 | 12.97 | 7.7106 | 7.0488 | 1.6659 | 2.517 | 1.0047 | 0.34295 | 2.930 | 0.67384 | 0.33088 |

# TRIAXIAL COMPRESSION TEST REPORT

AECOM





| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ○ | △ | □ | |
| Test No. | | 2 PSI | 11.1 PSI | 12 PSI | |
| Initial | Diameter, in | 2.8287 | 2.8621 | 2.8709 | |
| | Height, in | 5.9118 | 5.4677 | 4.6028 | |
| | Water Content, % | 244.32 | 220.26 | 192.30 | |
| | Dry Density, pcf | 21.91 | 24.38 | 27.56 | |
| | Saturation, % | 97.15 | 98.90 | 99.59 | |
| | Void Ratio | 7.5294 | 6.6679 | 5.781 | |
| Before Shear | Water Content, % | 220.26 | 192.30 | 170.69 | |
| | Dry Density, pcf | 24.61 | 27.66 | 30.59 | |
| | Saturation, % | 100.00 | 100.00 | 100.00 | |
| | Void Ratio | 6.5946 | 5.7575 | 5.1104 | |
| | Back Press., tsf | 5.0422 | 5.066 | 5.0438 | |
| Minor Prin. Stress, tsf | | 0.14184 | 0.77317 | 1.9978 | |
| Max. Dev. Stress, tsf | | 0.18932 | 0.53003 | 1.0484 | |
| Time to Failure, min | | 240 | 245 | 270 | |
| Strain Rate, %/min | | 0.02 | 0.02 | 0.02 | |
| B-Value | | .99 | --- | --- | |
| Estimated Specific Gravity | | 2.99 | 2.99 | 2.99 | |
| Liquid Limit | | 73 | 73 | 73 | |
| Plastic Limit | | 50 | 50 | 50 | |
| Plasticity Index | | 23 | 23 | 23 | |
| Failure Sketch | |  |  |  | |

Project: RICO ARGENTINE SIT OU01

Location: RICO, CO

Project No.: 60157757

Boring No.: ST-2

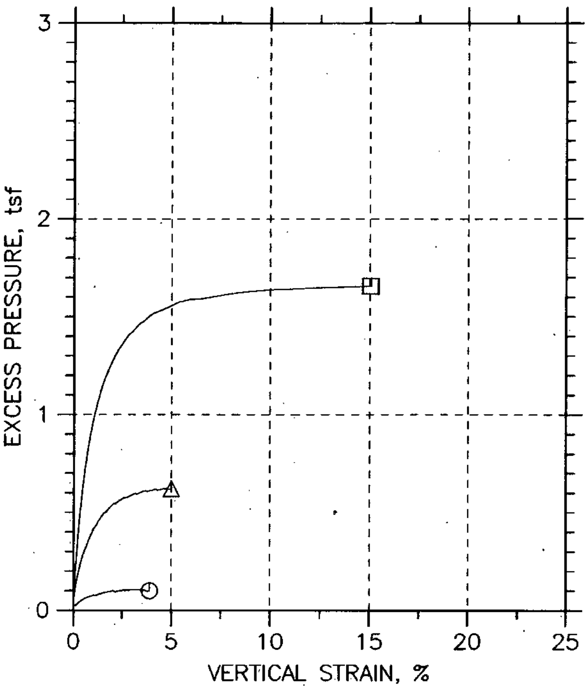
Sample Type: 3 " ST

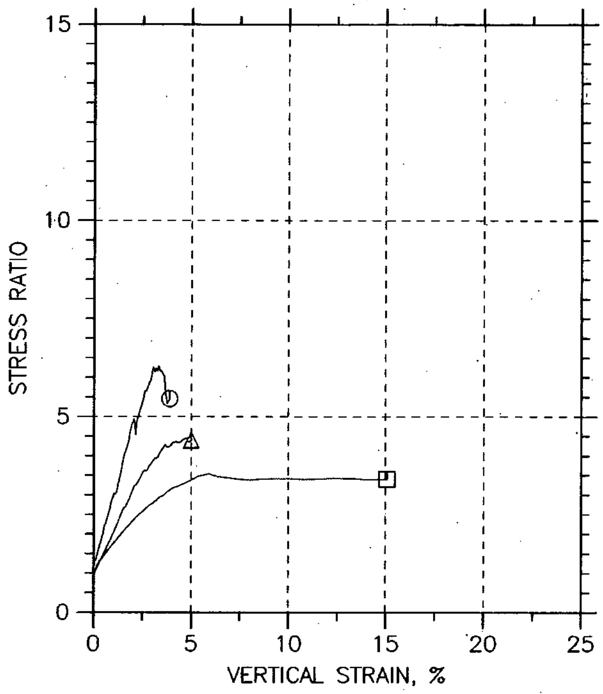
Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST

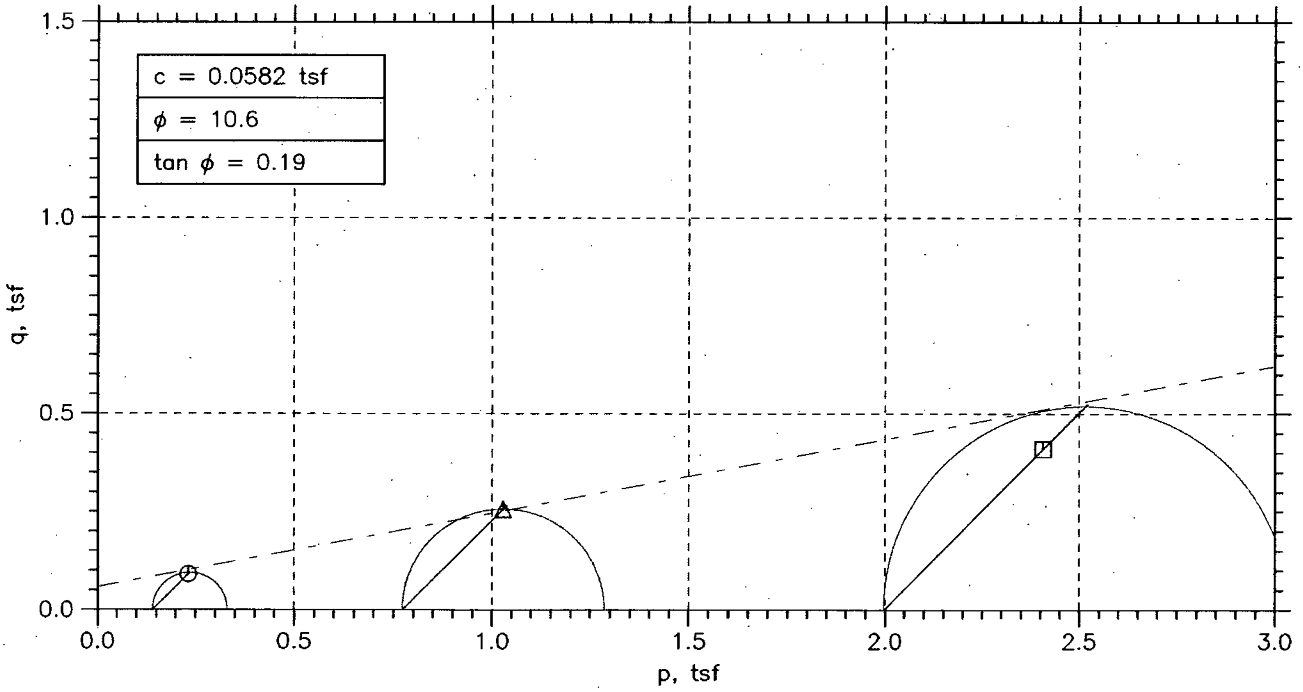
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Thu, 01-DEC-2011 13:36:50

# TRIAXIAL COMPRESSION TEST REPORT







| | | |
|---|---|---|
| Project: RICO ARGENTINE SIT OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-2 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-2 | Test Date: 11/22/11 | Depth: 2.0'-4.0 |
| st No.: ST-2 | Sample Type: 3 " ST | Elevation: ---- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST | | |
| Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767 | | |
| | | |

Thu, 01-DEC-2011 13:37:40

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO ARGENTINE SIT OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-2 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-2 | Test Date: 11/22/11 | Depth: 2.0'-4.0 |
| Test No.: ST-2 | Sample Type: 3 " ST | Elevation: ---- |

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

| | | |
|---|---|---|
| Specimen Height: 5.91 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.28 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 37.15 in^3 | Piston Weight: 0.00 lb | Correction Type: Uniform |
| Liquid Limit: 73 | Plastic Limit: 50 | Estimated Specific Gravity: 2.99 |

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.2846 | 0 | 0 | 5.0422 | 5.184 | 5.184 |
| 2 | 2.004 | 0.026104 | 6.2862 | 1.7469 | 0.020008 | 5.0616 | 5.184 | 5.204 |
| 3 | 4.004 | 0.053744 | 6.288 | 2.3292 | 0.02667 | 5.0666 | 5.184 | 5.2107 |
| 4 | 6.0041 | 0.081384 | 6.2897 | 2.9115 | 0.033328 | 5.0699 | 5.184 | 5.2173 |
| 5 | 8.0041 | 0.11056 | 6.2915 | 3.3349 | 0.038165 | 5.0683 | 5.184 | 5.2222 |
| 6 | 10.004 | 0.1382 | 6.2933 | 3.6526 | 0.041788 | 5.0677 | 5.184 | 5.2258 |
| 7 | 12.004 | 0.16584 | 6.295 | 4.076 | 0.04662 | 5.0721 | 5.184 | 5.2306 |
| 8 | 14 | 0.19348 | 6.2968 | 4.3937 | 0.050239 | 5.0755 | 5.184 | 5.2342 |
| 9 | 16 | 0.22112 | 6.2985 | 4.7642 | 0.054461 | 5.0783 | 5.184 | 5.2385 |
| 10 | 18 | 0.24876 | 6.3002 | 5.2406 | 0.05989 | 5.0805 | 5.184 | 5.2439 |
| 11 | 20 | 0.2764 | 6.302 | 5.6112 | 0.064107 | 5.0832 | 5.184 | 5.2481 |
| 12 | 22 | 0.30404 | 6.3037 | 5.77 | 0.065903 | 5.0855 | 5.184 | 5.2499 |
| 13 | 24 | 0.33168 | 6.3055 | 6.1405 | 0.070116 | 5.0877 | 5.184 | 5.2541 |
| 14 | 26 | 0.36086 | 6.3073 | 6.4052 | 0.073117 | 5.0894 | 5.184 | 5.2571 |
| 15 | 28 | 0.39003 | 6.3092 | 6.6699 | 0.076116 | 5.091 | 5.184 | 5.2601 |
| 16 | 30 | 0.41767 | 6.3109 | 6.9875 | 0.079719 | 5.0932 | 5.184 | 5.2637 |
| 17 | 35 | 0.48523 | 6.3152 | 7.6757 | 0.08751 | 5.0977 | 5.184 | 5.2715 |
| 18 | 40.001 | 0.55587 | 6.3197 | 8.6285 | 0.098304 | 5.1016 | 5.184 | 5.2823 |
| 19 | 45.001 | 0.62651 | 6.3242 | 8.8932 | 0.10125 | 5.1049 | 5.184 | 5.2852 |
| 20 | 50.001 | 0.69561 | 6.3286 | 9.2637 | 0.10539 | 5.1082 | 5.184 | 5.2894 |
| 21 | 55.001 | 0.76471 | 6.333 | 9.7402 | 0.11074 | 5.111 | 5.184 | 5.2947 |
| 22 | 60.001 | 0.83534 | 6.3375 | 10.058 | 0.11427 | 5.1138 | 5.184 | 5.2983 |
| 23 | 65.001 | 0.90598 | 6.342 | 10.746 | 0.122 | 5.1166 | 5.184 | 5.306 |
| 24 | 70.001 | 0.97508 | 6.3465 | 11.064 | 0.12551 | 5.1188 | 5.184 | 5.3095 |
| 25 | 75.001 | 1.0457 | 6.351 | 11.381 | 0.12903 | 5.121 | 5.184 | 5.313 |
| 26 | 80.001 | 1.1148 | 6.3554 | 11.752 | 0.13313 | 5.1182 | 5.184 | 5.3171 |
| 27 | 85.001 | 1.1854 | 6.36 | 11.911 | 0.13484 | 5.1193 | 5.184 | 5.3188 |
| 28 | 90.001 | 1.2545 | 6.3644 | 12.334 | 0.13953 | 5.1227 | 5.184 | 5.3235 |
| 29 | 95.002 | 1.3236 | 6.3689 | 12.44 | 0.14063 | 5.1255 | 5.184 | 5.3246 |
| [illegible] | 100 | 1.3927 | 6.3733 | 12.705 | 0.14352 | 5.1277 | 5.184 | 5.3275 |
| [illegible] | 105 | 1.4618 | 6.3778 | 13.075 | 0.14761 | 5.1299 | 5.184 | 5.3316 |
| 32 | 110 | 1.5325 | 6.3824 | 13.446 | 0.15168 | 5.1321 | 5.184 | 5.3357 |
| 33 | 115 | 1.6016 | 6.3869 | 13.604 | 0.15336 | 5.1338 | 5.184 | 5.3374 |
| 34 | 120 | 1.6707 | 6.3914 | 13.657 | 0.15385 | 5.1354 | 5.184 | 5.3379 |
| 35 | 125 | 1.7413 | 6.3959 | 13.763 | 0.15493 | 5.1366 | 5.184 | 5.3389 |
| 36 | 130 | 1.8104 | 6.4005 | 13.975 | 0.15721 | 5.1377 | 5.184 | 5.3412 |
| 37 | 135 | 1.8795 | 6.405 | 14.557 | 0.16364 | 5.1388 | 5.184 | 5.3476 |
| 38 | 140 | 1.9502 | 6.4096 | 14.822 | 0.1665 | 5.1399 | 5.184 | 5.3505 |
| 39 | 145 | 2.0177 | 6.414 | 14.822 | 0.16638 | 5.141 | 5.184 | 5.3504 |
| 40 | 150 | 2.0884 | 6.4186 | 14.928 | 0.16745 | 5.1416 | 5.184 | 5.3515 |
| 41 | 155 | 2.1575 | 6.4232 | 15.193 | 0.1703 | 5.136 | 5.184 | 5.3543 |
| 42 | 160 | 2.2281 | 6.4278 | 15.828 | 0.17729 | 5.1388 | 5.184 | 5.3613 |
| 43 | 165 | 2.2972 | 6.4323 | 15.563 | 0.1742 | 5.1404 | 5.184 | 5.3582 |
| 44 | 170 | 2.3678 | 6.437 | 15.51 | 0.17349 | 5.1421 | 5.184 | 5.3575 |
| 45 | 175 | 2.4385 | 6.4417 | 15.457 | 0.17277 | 5.1432 | 5.184 | 5.3568 |
| 46 | 180 | 2.5076 | 6.4462 | 15.457 | 0.17265 | 5.1443 | 5.184 | 5.3566 |
| 47 | 185 | 2.5782 | 6.4509 | 15.722 | 0.17548 | 5.1449 | 5.184 | 5.3595 |
| 48 | 190 | 2.6473 | 6.4555 | 15.881 | 0.17712 | 5.146 | 5.184 | 5.3611 |
| 49 | 195 | 2.7179 | 6.4602 | 15.881 | 0.17699 | 5.146 | 5.184 | 5.361 |
| 50 | 200 | 2.7886 | 6.4649 | 15.987 | 0.17804 | 5.1466 | 5.184 | 5.362 |
| 51 | 205 | 2.8577 | 6.4695 | 16.092 | 0.1791 | 5.1471 | 5.184 | 5.3631 |
| 52 | 210 | 2.9283 | 6.4742 | 16.092 | 0.17897 | 5.1477 | 5.184 | 5.363 |
| 53 | 215 | 2.9989 | 6.4789 | 16.622 | 0.18472 | 5.1477 | 5.184 | 5.3687 |
| 54 | 220 | 3.0696 | 6.4836 | 16.992 | 0.1887 | 5.1482 | 5.184 | 5.3727 |
| 55 | 225 | 3.1387 | 6.4882 | 16.834 | 0.1868 | 5.1477 | 5.184 | 5.3708 |
| 56 | 230 | 3.2108 | 6.4931 | 16.886 | 0.18725 | 5.1482 | 5.184 | 5.3712 |
| 57 | 235 | 3.2815 | 6.4978 | 16.939 | 0.1877 | 5.1477 | 5.184 | 5.3717 |
| 58 | 240 | 3.3521 | 6.5025 | 17.098 | 0.18932 | 5.1482 | 5.184 | 5.3733 |
| 59 | 245 | 3.4212 | 6.5072 | 16.939 | 0.18743 | 5.1477 | 5.184 | 5.3714 |
| 60 | 250 | 3.4918 | 6.512 | 16.992 | 0.18788 | 5.1477 | 5.184 | 5.3719 |
| 61 | 255 | 3.5609 | 6.5166 | 16.992 | 0.18774 | 5.1471 | 5.184 | 5.3717 |
| 62 | 260 | 3.6331 | 6.5215 | 16.834 | 0.18585 | 5.1471 | 5.184 | 5.3698 |
| 63 | 265 | 3.7022 | 6.5262 | 16.728 | 0.18455 | 5.1438 | 5.184 | 5.3685 |
| 64 | 270 | 3.7729 | 6.531 | 16.886 | 0.18616 | 5.141 | 5.184 | 5.3702 |
| 65 | 275 | 3.8435 | 6.5358 | 16.728 | 0.18428 | 5.1421 | 5.184 | 5.3683 |
| 66 | 279.67 | 3.9095 | 6.5403 | 16.516 | 0.18182 | 5.1432 | 5.184 | 5.3658 |

# TRIAXIAL TEST

AECOM

Project: RICO ARGENTINE SIT OU01
Boring No.: ST-2
Sample No.: ST-2
Test No.: ST-2

Location: RICO, CO
Tested By: BCM
Test Date: 11/22/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.91 in
Specimen Area: 6.28 in^2
Specimen Volume: 37.15 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.184 | 5.184 | 0 | 0.000 | 0.14184 | 0.14184 | 1.000 | 0.14184 | 0 |
| 2 | 0.03 | 5.204 | 5.184 | 0.019436 | 0.971 | 0.14242 | 0.12241 | 1.163 | 0.13241 | 0.010004 |
| 3 | 0.05 | 5.2107 | 5.184 | 0.024433 | 0.916 | 0.14408 | 0.11741 | 1.227 | 0.13074 | 0.013335 |
| 4 | 0.08 | 5.2173 | 5.184 | 0.027765 | 0.833 | 0.14741 | 0.11408 | 1.292 | 0.13074 | 0.016664 |
| 5 | 0.11 | 5.2222 | 5.184 | 0.026099 | 0.684 | 0.15391 | 0.11574 | 1.330 | 0.13483 | 0.019082 |
| 6 | 0.14 | 5.2258 | 5.184 | 0.025544 | 0.611 | 0.15809 | 0.1163 | 1.359 | 0.13719 | 0.020894 |
| 7 | 0.17 | 5.2306 | 5.184 | 0.029986 | 0.643 | 0.15848 | 0.11186 | 1.417 | 0.13517 | 0.02331 |
| 8 | 0.19 | 5.2342 | 5.184 | 0.033318 | 0.663 | 0.15876 | 0.10853 | 1.463 | 0.13364 | 0.02512 |
| 9 | 0.22 | 5.2385 | 5.184 | 0.036095 | 0.663 | 0.16021 | 0.10575 | 1.515 | 0.13298 | 0.02723 |
| 10 | 0.25 | 5.2439 | 5.184 | 0.038316 | 0.640 | 0.16342 | 0.10353 | 1.578 | 0.13347 | 0.029945 |
| 11 | 0.28 | 5.2481 | 5.184 | 0.041092 | 0.641 | 0.16486 | 0.10075 | 1.636 | 0.1328 | 0.032054 |
| 12 | 0.30 | 5.2499 | 5.184 | 0.043314 | 0.657 | 0.16443 | 0.09853 | 1.669 | 0.13148 | 0.032952 |
| 13 | 0.33 | 5.2541 | 5.184 | 0.045535 | 0.649 | 0.16642 | 0.096308 | 1.728 | 0.13137 | 0.035058 |
| 14 | 0.36 | 5.2571 | 5.184 | 0.047201 | 0.646 | 0.16776 | 0.094643 | 1.773 | 0.1312 | 0.036559 |
| 15 | 0.39 | 5.2601 | 5.184 | 0.048867 | 0.642 | 0.16909 | 0.092977 | 1.819 | 0.13103 | 0.038058 |
| 16 | 0.42 | 5.2637 | 5.184 | 0.051088 | 0.641 | 0.17047 | 0.090755 | 1.878 | 0.13061 | 0.039859 |
| 17 | 0.49 | 5.2715 | 5.184 | 0.05553 | 0.635 | 0.17382 | 0.086313 | 2.014 | 0.13007 | 0.043755 |
| 18 | 0.56 | 5.2823 | 5.184 | 0.059417 | 0.604 | 0.18073 | 0.082426 | 2.193 | 0.13158 | 0.049152 |
| 19 | 0.63 | 5.2852 | 5.184 | 0.062749 | 0.620 | 0.18034 | 0.079094 | 2.280 | 0.12972 | 0.050624 |
| 20 | 0.70 | 5.2894 | 5.184 | 0.066081 | 0.627 | 0.18115 | 0.075762 | 2.391 | 0.12846 | 0.052696 |
| 21 | 0.76 | 5.2947 | 5.184 | 0.068858 | 0.622 | 0.18372 | 0.072986 | 2.517 | 0.12835 | 0.055368 |
| 22 | 0.84 | 5.2983 | 5.184 | 0.071634 | 0.627 | 0.18447 | 0.070209 | 2.628 | 0.12734 | 0.057133 |
| 23 | 0.91 | 5.306 | 5.184 | 0.074411 | 0.610 | 0.18943 | 0.067433 | 2.809 | 0.12843 | 0.060998 |
| 24 | 0.98 | 5.3095 | 5.184 | 0.076632 | 0.611 | 0.19073 | 0.065211 | 2.925 | 0.12797 | 0.062757 |
| 25 | 1.05 | 5.313 | 5.184 | 0.078853 | 0.611 | 0.19202 | 0.06299 | 3.048 | 0.1275 | 0.064513 |
| 26 | 1.11 | 5.3171 | 5.184 | 0.076077 | 0.571 | 0.1989 | 0.065767 | 3.024 | 0.13233 | 0.066567 |
| 27 | 1.19 | 5.3188 | 5.184 | 0.077187 | 0.572 | 0.19949 | 0.064656 | 3.085 | 0.13207 | 0.067418 |
| 28 | 1.25 | 5.3235 | 5.184 | 0.080519 | 0.577 | 0.20086 | 0.061324 | 3.275 | 0.13109 | 0.069767 |
| [illegible] | 1.32 | 5.3246 | 5.184 | 0.083296 | 0.592 | 0.19918 | 0.058548 | 3.402 | 0.12886 | 0.070316 |
| [illegible] | 1.39 | 5.3275 | 5.184 | 0.085517 | 0.596 | 0.19985 | 0.056327 | 3.548 | 0.12809 | 0.071762 |
| 31 | 1.46 | 5.3316 | 5.184 | 0.087738 | 0.594 | 0.20171 | 0.054105 | 3.728 | 0.12791 | 0.073803 |
| 32 | 1.53 | 5.3357 | 5.184 | 0.089959 | 0.593 | 0.20357 | 0.051884 | 3.923 | 0.12772 | 0.07584 |
| 33 | 1.60 | 5.3374 | 5.184 | 0.091625 | 0.597 | 0.20358 | 0.050218 | 4.054 | 0.1269 | 0.076682 |
| 34 | 1.67 | 5.3379 | 5.184 | 0.093291 | 0.606 | 0.20241 | 0.048552 | 4.169 | 0.12548 | 0.076927 |
| 35 | 1.74 | 5.3389 | 5.184 | 0.094402 | 0.609 | 0.20238 | 0.047442 | 4.266 | 0.12491 | 0.077467 |
| 36 | 1.81 | 5.3412 | 5.184 | 0.095512 | 0.608 | 0.20354 | 0.046331 | 4.393 | 0.12493 | 0.078604 |
| 37 | 1.88 | 5.3476 | 5.184 | 0.096623 | 0.590 | 0.20886 | 0.04522 | 4.619 | 0.12704 | 0.081821 |
| 38 | 1.95 | 5.3505 | 5.184 | 0.097733 | 0.587 | 0.21061 | 0.04411 | 4.775 | 0.12736 | 0.083249 |
| 39 | 2.02 | 5.3504 | 5.184 | 0.098844 | 0.594 | 0.20938 | 0.042999 | 4.869 | 0.12619 | 0.083192 |
| 40 | 2.09 | 5.3515 | 5.184 | 0.099399 | 0.594 | 0.20989 | 0.042444 | 4.945 | 0.12617 | 0.083726 |
| 41 | 2.16 | 5.3543 | 5.184 | 0.093846 | 0.551 | 0.2183 | 0.047997 | 4.548 | 0.13315 | 0.08515 |
| 42 | 2.23 | 5.3613 | 5.184 | 0.096623 | 0.545 | 0.22251 | 0.04522 | 4.921 | 0.13387 | 0.088646 |
| 43 | 2.30 | 5.3582 | 5.184 | 0.098289 | 0.564 | 0.21776 | 0.043555 | 5.000 | 0.13066 | 0.087102 |
| 44 | 2.37 | 5.3575 | 5.184 | 0.099955 | 0.576 | 0.21537 | 0.041889 | 5.142 | 0.12863 | 0.086743 |
| 45 | 2.44 | 5.3568 | 5.184 | 0.10107 | 0.585 | 0.21355 | 0.040778 | 5.237 | 0.12716 | 0.086385 |
| 46 | 2.51 | 5.3566 | 5.184 | 0.10218 | 0.592 | 0.21231 | 0.039667 | 5.352 | 0.12599 | 0.086323 |
| 47 | 2.58 | 5.3595 | 5.184 | 0.10273 | 0.585 | 0.21459 | 0.039112 | 5.486 | 0.12685 | 0.087738 |
| 48 | 2.65 | 5.3611 | 5.184 | 0.10384 | 0.586 | 0.21512 | 0.038002 | 5.661 | 0.12656 | 0.088561 |
| 49 | 2.72 | 5.361 | 5.184 | 0.10384 | 0.587 | 0.215 | 0.038002 | 5.658 | 0.1265 | 0.088497 |
| 50 | 2.79 | 5.362 | 5.184 | 0.1044 | 0.586 | 0.21549 | 0.037446 | 5.755 | 0.12647 | 0.089022 |
| 51 | 2.86 | 5.3631 | 5.184 | 0.10495 | 0.586 | 0.21599 | 0.036891 | 5.855 | 0.12644 | 0.089548 |
| 52 | 2.93 | 5.363 | 5.184 | 0.10551 | 0.590 | 0.2153 | 0.036336 | 5.925 | 0.12582 | 0.089483 |
| 53 | 3.00 | 5.3687 | 5.184 | 0.10551 | 0.571 | 0.22105 | 0.036336 | 6.084 | 0.12869 | 0.092359 |
| 54 | 3.07 | 5.3727 | 5.184 | 0.10606 | 0.562 | 0.22448 | 0.03578 | 6.274 | 0.13013 | 0.094349 |
| 55 | 3.14 | 5.3708 | 5.184 | 0.10551 | 0.565 | 0.22314 | 0.036336 | 6.141 | 0.12974 | 0.093401 |
| 56 | 3.21 | 5.3712 | 5.184 | 0.10606 | 0.566 | 0.22303 | 0.03578 | 6.233 | 0.12941 | 0.093625 |
| 57 | 3.28 | 5.3717 | 5.184 | 0.10551 | 0.562 | 0.22404 | 0.036336 | 6.166 | 0.13019 | 0.09385 |
| 58 | 3.35 | 5.3733 | 5.184 | 0.10606 | 0.560 | 0.2251 | 0.03578 | 6.291 | 0.13044 | 0.094661 |
| 59 | 3.42 | 5.3714 | 5.184 | 0.10551 | 0.563 | 0.22376 | 0.036336 | 6.158 | 0.13005 | 0.093714 |
| 60 | 3.49 | 5.3719 | 5.184 | 0.10551 | 0.562 | 0.22421 | 0.036336 | 6.171 | 0.13027 | 0.093938 |
| 61 | 3.56 | 5.3717 | 5.184 | 0.10495 | 0.559 | 0.22463 | 0.036891 | 6.089 | 0.13076 | 0.093871 |
| 62 | 3.63 | 5.3698 | 5.184 | 0.10495 | 0.565 | 0.22274 | 0.036891 | 6.038 | 0.12982 | 0.092924 |
| 63 | 3.70 | 5.3685 | 5.184 | 0.10162 | 0.551 | 0.22477 | 0.040223 | 5.588 | 0.1325 | 0.092274 |
| 64 | 3.77 | 5.3702 | 5.184 | 0.098844 | 0.531 | 0.22916 | 0.042999 | 5.329 | 0.13608 | 0.093081 |
| 65 | 3.84 | 5.3683 | 5.184 | 0.099955 | 0.542 | 0.22617 | 0.041889 | 5.399 | 0.13403 | 0.092138 |
| 66 | 3.91 | 5.3658 | 5.184 | 0.10107 | 0.556 | 0.2226 | 0.040778 | 5.459 | 0.13169 | 0.09091 |

## TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-2 STAGE2
Sample No.: STAGE 2
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/28/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.47 in
Specimen Area: 6.43 in^2
Specimen Volume: 35.18 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.4338 | 0 | 0 | 5.066 | 5.8392 | 5.8392 |
| 2 | 2.0042 | 0.029885 | 6.4357 | 0.95284 | 0.01066 | 5.1349 | 5.8392 | 5.8499 |
| 3 | 4 | 0.05977 | 6.4376 | 1.3234 | 0.014801 | 5.1588 | 5.8392 | 5.854 |
| 4 | 6.0001 | 0.089655 | 6.4396 | 1.5351 | 0.017164 | 5.1704 | 5.8392 | 5.8564 |
| 5 | 8.0001 | 0.11954 | 6.4415 | 3.7055 | 0.041418 | 5.1904 | 5.8392 | 5.8806 |
| 6 | 10 | 0.14942 | 6.4434 | 5.77 | 0.064475 | 5.2093 | 5.8392 | 5.9037 |
| 7 | 12 | 0.18097 | 6.4455 | 7.358 | 0.082194 | 5.2265 | 5.8392 | 5.9214 |
| 8 | 14 | 0.21085 | 6.4474 | 9.1579 | 0.10227 | 5.2421 | 5.8392 | 5.9415 |
| 9 | 16 | 0.24074 | 6.4493 | 10.534 | 0.1176 | 5.2559 | 5.8392 | 5.9568 |
| 10 | 18 | 0.27062 | 6.4513 | 12.069 | 0.1347 | 5.2693 | 5.8392 | 5.9739 |
| 11 | 20 | 0.30051 | 6.4532 | 13.446 | 0.15002 | 5.2815 | 5.8392 | 5.9892 |
| 12 | 22 | 0.33205 | 6.4552 | 14.293 | 0.15942 | 5.2932 | 5.8392 | 5.9986 |
| 13 | 24 | 0.36194 | 6.4572 | 15.616 | 0.17412 | 5.3043 | 5.8392 | 6.0133 |
| 14 | 26 | 0.39182 | 6.4591 | 16.781 | 0.18705 | 5.3154 | 5.8392 | 6.0263 |
| 15 | 28 | 0.42171 | 6.461 | 17.892 | 0.19939 | 5.3259 | 5.8392 | 6.0386 |
| 16 | 30 | 0.45159 | 6.463 | 19.11 | 0.21289 | 5.3359 | 5.8392 | 6.0521 |
| 17 | 35.001 | 0.52797 | 6.4679 | 21.598 | 0.24042 | 5.3603 | 5.8392 | 6.0796 |
| 18 | 40.001 | 0.60268 | 6.4728 | 23.874 | 0.26556 | 5.3792 | 5.8392 | 6.1048 |
| 19 | 45.001 | 0.67573 | 6.4776 | 26.256 | 0.29184 | 5.3964 | 5.8392 | 6.131 |
| 20 | 50.001 | 0.75044 | 6.4824 | 28.215 | 0.31338 | 5.417 | 5.8392 | 6.1526 |
| 21 | 55.001 | 0.82682 | 6.4874 | 29.75 | 0.33017 | 5.4353 | 5.8392 | 6.1694 |
| 22 | 60.001 | 0.90153 | 6.4923 | 31.708 | 0.35165 | 5.4525 | 5.8392 | 6.1908 |
| 23 | 65.001 | 0.97624 | 6.4972 | 33.085 | 0.36663 | 5.4686 | 5.8392 | 6.2058 |
| 24 | 70.001 | 1.051 | 6.5021 | 34.408 | 0.38101 | 5.4836 | 5.8392 | 6.2202 |
| 25 | 75.001 | 1.124 | 6.5069 | 36.102 | 0.39947 | 5.4936 | 5.8392 | 6.2387 |
| 26 | 80.001 | 1.1971 | 6.5117 | 37.584 | 0.41557 | 5.5047 | 5.8392 | 6.2548 |
| 27 | 85.001 | 1.2718 | 6.5167 | 38.908 | 0.42987 | 5.5186 | 5.8392 | 6.2691 |
| 28 | 90.002 | 1.3465 | 6.5216 | 39.861 | 0.44007 | 5.5308 | 5.8392 | 6.2793 |
| 29 | 95.002 | 1.4212 | 6.5266 | 40.76 | 0.44966 | 5.5425 | 5.8392 | 6.2889 |
| [illegible] | 100 | 1.4959 | 6.5315 | 41.449 | 0.45691 | 5.553 | 5.8392 | 6.2961 |
| [illegible] | 105 | 1.5723 | 6.5366 | 41.978 | 0.46238 | 5.563 | 5.8392 | 6.3016 |
| 32 | 110 | 1.647 | 6.5415 | 42.243 | 0.46495 | 5.5669 | 5.8392 | 6.3041 |
| 33 | 115 | 1.72 | 6.5464 | 42.984 | 0.47275 | 5.5747 | 5.8392 | 6.312 |
| 34 | 120 | 1.7964 | 6.5515 | 43.248 | 0.47529 | 5.5841 | 5.8392 | 6.3145 |
| 35 | 125 | 1.8728 | 6.5566 | 43.884 | 0.4819 | 5.5925 | 5.8392 | 6.3211 |
| 36 | 130 | 1.9458 | 6.5615 | 44.784 | 0.49142 | 5.5997 | 5.8392 | 6.3306 |
| 37 | 135 | 2.0239 | 6.5667 | 45.366 | 0.49741 | 5.6069 | 5.8392 | 6.3366 |
| 38 | 140 | 2.0969 | 6.5716 | 46.107 | 0.50516 | 5.613 | 5.8392 | 6.3444 |
| 39 | 145 | 2.1733 | 6.5767 | 46.477 | 0.50882 | 5.613 | 5.8392 | 6.348 |
| 40 | 150 | 2.2497 | 6.5819 | 46.636 | 0.51016 | 5.6186 | 5.8392 | 6.3494 |
| 41 | 155 | 2.3244 | 6.5869 | 46.689 | 0.51035 | 5.6247 | 5.8392 | 6.3495 |
| 42 | 160 | 2.3991 | 6.5919 | 46.689 | 0.50996 | 5.6302 | 5.8392 | 6.3492 |
| 43 | 165 | 2.4738 | 6.597 | 46.954 | 0.51246 | 5.6352 | 5.8392 | 6.3517 |
| 44 | 170 | 2.5502 | 6.6022 | 47.483 | 0.51783 | 5.6397 | 5.8392 | 6.357 |
| 45 | 175 | 2.6266 | 6.6073 | 47.219 | 0.51454 | 5.6441 | 5.8392 | 6.3537 |
| 46 | 180 | 2.7029 | 6.6125 | 47.536 | 0.51759 | 5.6413 | 5.8392 | 6.3568 |
| 47 | 185 | 2.7776 | 6.6176 | 47.219 | 0.51374 | 5.6458 | 5.8392 | 6.3529 |
| 48 | 190 | 2.8557 | 6.6229 | 47.589 | 0.51736 | 5.6502 | 5.8392 | 6.3566 |
| 49 | 195 | 2.9304 | 6.628 | 47.324 | 0.51408 | 5.6541 | 5.8392 | 6.3533 |
| 50 | 200 | 3.0068 | 6.6332 | 47.483 | 0.5154 | 5.6574 | 5.8392 | 6.3546 |
| 51 | 205 | 3.0831 | 6.6385 | 47.589 | 0.51615 | 5.6608 | 5.8392 | 6.3553 |
| 52 | 210 | 3.1595 | 6.6437 | 47.748 | 0.51746 | 5.6641 | 5.8392 | 6.3567 |
| 53 | 215 | 3.2359 | 6.6489 | 48.277 | 0.52278 | 5.6613 | 5.8392 | 6.362 |
| 54 | 220 | 3.3106 | 6.6541 | 48.33 | 0.52295 | 5.6635 | 5.8392 | 6.3622 |
| 55 | 225 | 3.387 | 6.6593 | 48.754 | 0.52712 | 5.6674 | 5.8392 | 6.3663 |
| 56 | 230 | 3.4617 | 6.6645 | 48.86 | 0.52785 | 5.6702 | 5.8392 | 6.3671 |
| 57 | 235 | 3.5397 | 6.6699 | 48.754 | 0.52629 | 5.6735 | 5.8392 | 6.3655 |
| 58 | 240 | 3.6161 | 6.6752 | 48.912 | 0.52758 | 5.6758 | 5.8392 | 6.3668 |
| 59 | 245 | 3.6908 | 6.6804 | 49.177 | 0.53003 | 5.678 | 5.8392 | 6.3692 |
| 60 | 250 | 3.7655 | 6.6855 | 49.124 | 0.52904 | 5.6752 | 5.8392 | 6.3682 |
| 61 | 255 | 3.8402 | 6.6907 | 48.912 | 0.52635 | 5.6758 | 5.8392 | 6.3656 |
| 62 | 260 | 3.9166 | 6.6961 | 48.595 | 0.52252 | 5.678 | 5.8392 | 6.3617 |
| 63 | 265 | 3.9913 | 6.7013 | 48.648 | 0.52268 | 5.6802 | 5.8392 | 6.3619 |
| 64 | 270 | 4.0677 | 6.7066 | 48.86 | 0.52454 | 5.6824 | 5.8392 | 6.3637 |
| 65 | 275 | 4.1424 | 6.7118 | 48.277 | 0.51789 | 5.6841 | 5.8392 | 6.3571 |
| 66 | 280 | 4.2188 | 6.7172 | 48.33 | 0.51804 | 5.6858 | 5.8392 | 6.3572 |
| 67 | 285 | 4.2951 | 6.7225 | 48.595 | 0.52046 | 5.683 | 5.8392 | 6.3597 |
| 68 | 290 | 4.3715 | 6.7279 | 48.912 | 0.52345 | 5.6824 | 5.8392 | 6.3626 |
| 69 | 295 | 4.4479 | 6.7333 | 48.489 | 0.5185 | 5.6846 | 5.8392 | 6.3577 |
| 70 | 300 | 4.5259 | 6.7388 | 48.224 | 0.51525 | 5.6869 | 5.8392 | 6.3544 |
| [illegible] | 305 | 4.6023 | 6.7442 | 48.224 | 0.51484 | 5.6885 | 5.8392 | 6.354 |
| [illegible] | 310 | 4.6787 | 6.7496 | 48.171 | 0.51386 | 5.6896 | 5.8392 | 6.3531 |
| 73 | 315 | 4.755 | 6.755 | 48.224 | 0.51401 | 5.6902 | 5.8392 | 6.3532 |
| 74 | 320 | 4.8331 | 6.7605 | 48.224 | 0.51359 | 5.6869 | 5.8392 | 6.3528 |
| 75 | 325 | 4.9078 | 6.7658 | 48.33 | 0.51431 | 5.6863 | 5.8392 | 6.3535 |
| 76 | 330 | 4.9858 | 6.7714 | 48.171 | 0.5122 | 5.688 | 5.8392 | 6.3514 |
| 77 | 331.7 | 5.0107 | 6.7732 | 48.224 | 0.51263 | 5.6885 | 5.8392 | 6.3518 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-2 STAGE2
Sample No.: STAGE 2
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/28/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 5.47 in
Specimen Area: 6.43 in^2
Specimen Volume: 35.18 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.8392 | 5.8392 | 0 | 0.000 | 0.77317 | 0.77317 | 1.000 | 0.77317 | 0 |
| 2 | 0.03 | 5.8499 | 5.8392 | 0.068858 | 6.459 | 0.71497 | 0.70431 | 1.015 | 0.70964 | 0.00533 |
| 3 | 0.06 | 5.854 | 5.8392 | 0.092736 | 6.265 | 0.69523 | 0.68043 | 1.022 | 0.68783 | 0.0074005 |
| 4 | 0.09 | 5.8564 | 5.8392 | 0.1044 | 6.082 | 0.68593 | 0.66877 | 1.026 | 0.67735 | 0.0085821 |
| 5 | 0.12 | 5.8806 | 5.8392 | 0.12439 | 3.003 | 0.6902 | 0.64878 | 1.064 | 0.66949 | 0.020709 |
| 6 | 0.15 | 5.9037 | 5.8392 | 0.14327 | 2.222 | 0.69437 | 0.6299 | 1.102 | 0.66213 | 0.032237 |
| 7 | 0.18 | 5.9214 | 5.8392 | 0.16048 | 1.952 | 0.69488 | 0.61268 | 1.134 | 0.65378 | 0.041097 |
| 8 | 0.21 | 5.9415 | 5.8392 | 0.17603 | 1.721 | 0.6994 | 0.59713 | 1.171 | 0.64827 | 0.051134 |
| 9 | 0.24 | 5.9568 | 5.8392 | 0.18991 | 1.615 | 0.70085 | 0.58325 | 1.202 | 0.64205 | 0.058802 |
| 10 | 0.27 | 5.9739 | 5.8392 | 0.20324 | 1.509 | 0.70463 | 0.56992 | 1.236 | 0.63727 | 0.067351 |
| 11 | 0.30 | 5.9892 | 5.8392 | 0.21546 | 1.436 | 0.70772 | 0.55771 | 1.269 | 0.63272 | 0.075008 |
| 12 | 0.33 | 5.9986 | 5.8392 | 0.22712 | 1.425 | 0.70546 | 0.54605 | 1.292 | 0.62575 | 0.079708 |
| 13 | 0.36 | 6.0133 | 5.8392 | 0.23823 | 1.368 | 0.70906 | 0.53494 | 1.326 | 0.622 | 0.087062 |
| 14 | 0.39 | 6.0263 | 5.8392 | 0.24933 | 1.333 | 0.71089 | 0.52383 | 1.357 | 0.61736 | 0.093527 |
| 15 | 0.42 | 6.0386 | 5.8392 | 0.25988 | 1.303 | 0.71267 | 0.51328 | 1.388 | 0.61298 | 0.099693 |
| 16 | 0.45 | 6.0521 | 5.8392 | 0.26988 | 1.268 | 0.71618 | 0.50329 | 1.423 | 0.60973 | 0.10644 |
| 17 | 0.53 | 6.0796 | 5.8392 | 0.29431 | 1.224 | 0.71928 | 0.47885 | 1.502 | 0.59907 | 0.12021 |
| 18 | 0.60 | 6.1048 | 5.8392 | 0.31319 | 1.179 | 0.72553 | 0.45997 | 1.577 | 0.59275 | 0.13278 |
| 19 | 0.68 | 6.131 | 5.8392 | 0.33041 | 1.132 | 0.7346 | 0.44276 | 1.659 | 0.58868 | 0.14592 |
| 20 | 0.75 | 6.1526 | 5.8392 | 0.35095 | 1.120 | 0.73559 | 0.42221 | 1.742 | 0.5789 | 0.15669 |
| 21 | 0.83 | 6.1694 | 5.8392 | 0.36928 | 1.118 | 0.73406 | 0.40389 | 1.817 | 0.56898 | 0.16509 |
| 22 | 0.90 | 6.1908 | 5.8392 | 0.38649 | 1.099 | 0.73832 | 0.38667 | 1.909 | 0.5625 | 0.17582 |
| 23 | 0.98 | 6.2058 | 5.8392 | 0.4026 | 1.098 | 0.7372 | 0.37057 | 1.989 | 0.55389 | 0.18332 |
| 24 | 1.05 | 6.2202 | 5.8392 | 0.41759 | 1.096 | 0.73659 | 0.35558 | 2.072 | 0.54608 | 0.19051 |
| 25 | 1.12 | 6.2387 | 5.8392 | 0.42758 | 1.070 | 0.74506 | 0.34558 | 2.156 | 0.54532 | 0.19974 |
| 26 | 1.20 | 6.2548 | 5.8392 | 0.43869 | 1.056 | 0.75004 | 0.33448 | 2.242 | 0.54226 | 0.20778 |
| 27 | 1.27 | 6.2691 | 5.8392 | 0.45257 | 1.053 | 0.75047 | 0.32059 | 2.341 | 0.53553 | 0.21494 |
| 28 | 1.35 | 6.2793 | 5.8392 | 0.46479 | 1.056 | 0.74844 | 0.30838 | 2.427 | 0.52841 | 0.22003 |
| [illegible] | 1.42 | 6.2889 | 5.8392 | 0.47645 | 1.060 | 0.74638 | 0.29671 | 2.515 | 0.52155 | 0.22483 |
| [illegible] | 1.50 | 6.2961 | 5.8392 | 0.487 | 1.066 | 0.74307 | 0.28616 | 2.597 | 0.51462 | 0.22845 |
| 31 | 1.57 | 6.3016 | 5.8392 | 0.497 | 1.075 | 0.73855 | 0.27617 | 2.674 | 0.50736 | 0.23119 |
| 32 | 1.65 | 6.3041 | 5.8392 | 0.50088 | 1.077 | 0.73723 | 0.27228 | 2.708 | 0.50475 | 0.23247 |
| 33 | 1.72 | 6.312 | 5.8392 | 0.50866 | 1.076 | 0.73726 | 0.26451 | 2.787 | 0.50088 | 0.23638 |
| 34 | 1.80 | 6.3145 | 5.8392 | 0.5181 | 1.090 | 0.73036 | 0.25507 | 2.863 | 0.49271 | 0.23765 |
| 35 | 1.87 | 6.3211 | 5.8392 | 0.52643 | 1.092 | 0.72864 | 0.24674 | 2.953 | 0.48769 | 0.24095 |
| 36 | 1.95 | 6.3306 | 5.8392 | 0.53365 | 1.086 | 0.73093 | 0.23952 | 3.052 | 0.48523 | 0.24571 |
| 37 | 2.02 | 6.3366 | 5.8392 | 0.54087 | 1.087 | 0.72971 | 0.2323 | 3.141 | 0.481 | 0.2487 |
| 38 | 2.10 | 6.3444 | 5.8392 | 0.54697 | 1.083 | 0.73135 | 0.22619 | 3.233 | 0.47877 | 0.25258 |
| 39 | 2.17 | 6.348 | 5.8392 | 0.54697 | 1.075 | 0.73501 | 0.22619 | 3.250 | 0.4806 | 0.25441 |
| 40 | 2.25 | 6.3494 | 5.8392 | 0.55253 | 1.083 | 0.7308 | 0.22064 | 3.312 | 0.47572 | 0.25508 |
| 41 | 2.32 | 6.3495 | 5.8392 | 0.55864 | 1.095 | 0.72488 | 0.21453 | 3.379 | 0.4697 | 0.25517 |
| 42 | 2.40 | 6.3492 | 5.8392 | 0.56419 | 1.106 | 0.71894 | 0.20898 | 3.440 | 0.46396 | 0.25498 |
| 43 | 2.47 | 6.3517 | 5.8392 | 0.56919 | 1.111 | 0.71644 | 0.20398 | 3.512 | 0.46021 | 0.25623 |
| 44 | 2.55 | 6.357 | 5.8392 | 0.57363 | 1.108 | 0.71737 | 0.19954 | 3.595 | 0.45845 | 0.25891 |
| 45 | 2.63 | 6.3537 | 5.8392 | 0.57807 | 1.123 | 0.70963 | 0.19509 | 3.637 | 0.45236 | 0.25727 |
| 46 | 2.70 | 6.3568 | 5.8392 | 0.57529 | 1.111 | 0.71546 | 0.19787 | 3.616 | 0.45667 | 0.2588 |
| 47 | 2.78 | 6.3529 | 5.8392 | 0.57974 | 1.128 | 0.70717 | 0.19343 | 3.656 | 0.4503 | 0.25687 |
| 48 | 2.86 | 6.3566 | 5.8392 | 0.58418 | 1.129 | 0.70634 | 0.18899 | 3.738 | 0.44766 | 0.25868 |
| 49 | 2.93 | 6.3533 | 5.8392 | 0.58807 | 1.144 | 0.69918 | 0.1851 | 3.777 | 0.44214 | 0.25704 |
| 50 | 3.01 | 6.3546 | 5.8392 | 0.5914 | 1.147 | 0.69717 | 0.18177 | 3.836 | 0.43947 | 0.2577 |
| 51 | 3.08 | 6.3553 | 5.8392 | 0.59473 | 1.152 | 0.69458 | 0.17844 | 3.893 | 0.43651 | 0.25807 |
| 52 | 3.16 | 6.3567 | 5.8392 | 0.59806 | 1.156 | 0.69256 | 0.1751 | 3.955 | 0.43383 | 0.25873 |
| 53 | 3.24 | 6.362 | 5.8392 | 0.59529 | 1.139 | 0.70066 | 0.17788 | 3.939 | 0.43927 | 0.26139 |
| 54 | 3.31 | 6.3622 | 5.8392 | 0.59751 | 1.143 | 0.69861 | 0.17566 | 3.977 | 0.43714 | 0.26148 |
| 55 | 3.39 | 6.3663 | 5.8392 | 0.60139 | 1.141 | 0.69889 | 0.17177 | 4.069 | 0.43533 | 0.26356 |
| 56 | 3.46 | 6.3671 | 5.8392 | 0.60417 | 1.145 | 0.69685 | 0.16899 | 4.123 | 0.43292 | 0.26393 |
| 57 | 3.54 | 6.3655 | 5.8392 | 0.6075 | 1.154 | 0.69195 | 0.16566 | 4.177 | 0.42881 | 0.26314 |
| 58 | 3.62 | 6.3668 | 5.8392 | 0.60972 | 1.156 | 0.69102 | 0.16344 | 4.228 | 0.42723 | 0.26379 |
| 59 | 3.69 | 6.3692 | 5.8392 | 0.61194 | 1.155 | 0.69125 | 0.16122 | 4.288 | 0.42623 | 0.26501 |
| 60 | 3.77 | 6.3682 | 5.8392 | 0.60917 | 1.151 | 0.69304 | 0.164 | 4.226 | 0.42852 | 0.26452 |
| 61 | 3.84 | 6.3656 | 5.8392 | 0.60972 | 1.158 | 0.6898 | 0.16344 | 4.220 | 0.42662 | 0.26318 |
| 62 | 3.92 | 6.3617 | 5.8392 | 0.61194 | 1.171 | 0.68374 | 0.16122 | 4.241 | 0.42248 | 0.26126 |
| 63 | 3.99 | 6.3619 | 5.8392 | 0.61417 | 1.175 | 0.68168 | 0.159 | 4.287 | 0.42034 | 0.26134 |
| 64 | 4.07 | 6.3637 | 5.8392 | 0.61639 | 1.175 | 0.68132 | 0.15678 | 4.346 | 0.41905 | 0.26227 |
| 65 | 4.14 | 6.3571 | 5.8392 | 0.61805 | 1.193 | 0.673 | 0.15511 | 4.339 | 0.41406 | 0.25894 |
| 66 | 4.22 | 6.3572 | 5.8392 | 0.61972 | 1.196 | 0.67149 | 0.15345 | 4.376 | 0.41247 | 0.25902 |
| 67 | 4.30 | 6.3597 | 5.8392 | 0.61694 | 1.185 | 0.67669 | 0.15622 | 4.332 | 0.41645 | 0.26023 |
| 68 | 4.37 | 6.3626 | 5.8392 | 0.61639 | 1.178 | 0.68022 | 0.15678 | 4.339 | 0.4185 | 0.26172 |
| 69 | 4.45 | 6.3577 | 5.8392 | 0.61861 | 1.193 | 0.67306 | 0.15456 | 4.355 | 0.41381 | 0.25925 |
| [illegible] | 4.53 | 6.3544 | 5.8392 | 0.62083 | 1.205 | 0.66758 | 0.15234 | 4.382 | 0.40996 | 0.25762 |
| [illegible] | 4.60 | 6.354 | 5.8392 | 0.6225 | 1.209 | 0.66551 | 0.15067 | 4.417 | 0.40809 | 0.25742 |
| 72 | 4.68 | 6.3531 | 5.8392 | 0.62361 | 1.214 | 0.66342 | 0.14956 | 4.436 | 0.40649 | 0.25693 |
| 73 | 4.76 | 6.3532 | 5.8392 | 0.62416 | 1.214 | 0.66302 | 0.149 | 4.450 | 0.40601 | 0.25701 |
| 74 | 4.83 | 6.3528 | 5.8392 | 0.62083 | 1.209 | 0.66593 | 0.15234 | 4.371 | 0.40913 | 0.2568 |
| 75 | 4.91 | 6.3535 | 5.8392 | 0.62027 | 1.206 | 0.66721 | 0.15289 | 4.364 | 0.41005 | 0.25716 |
| 76 | 4.99 | 6.3514 | 5.8392 | 0.62194 | 1.214 | 0.66343 | 0.15123 | 4.387 | 0.40733 | 0.2561 |
| 77 | 5.01 | 6.3518 | 5.8392 | 0.6225 | 1.214 | 0.6633 | 0.15067 | 4.402 | 0.40699 | 0.25632 |

# TRIAXIAL TEST

Project: RICO ARGENTINE
Boring No.: ST-2 STAGE3
Sample No.: S-6
Test No.: 12 PSI

Location: INDOT LAPOINTE DISTRICT
Tested By: BCM
Test Date: 4/18/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 25.0'-27.3'
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767

Specimen Height: 4.60 in
Specimen Area: 6.47 in^2
Specimen Volume: 29.79 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

Plastic Limit: 50

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.4732 | 0 | 0 | 5.0438 | 7.0416 | 7.0416 |
| 2 | 5.0041 | 0.080863 | 6.4784 | 16.039 | 0.17826 | 5.2137 | 7.0416 | 7.2199 |
| 3 | 10 | 0.16764 | 6.484 | 27.156 | 0.30155 | 5.3381 | 7.0416 | 7.3431 |
| 4 | 15 | 0.25442 | 6.4897 | 35.626 | 0.39525 | 5.4459 | 7.0416 | 7.4369 |
| 5 | 20 | 0.3412 | 6.4953 | 42.56 | 0.47178 | 5.5403 | 7.0416 | 7.5134 |
| 6 | 25 | 0.42996 | 6.5011 | 48.171 | 0.5335 | 5.6202 | 7.0416 | 7.5751 |
| 7 | 30 | 0.51871 | 6.5069 | 53.412 | 0.59101 | 5.6969 | 7.0416 | 7.6326 |
| 8 | 35.001 | 0.60549 | 6.5126 | 57.541 | 0.63615 | 5.7652 | 7.0416 | 7.6777 |
| 9 | 40.001 | 0.69424 | 6.5184 | 61.246 | 0.67651 | 5.8285 | 7.0416 | 7.7181 |
| 10 | 45.001 | 0.78299 | 6.5242 | 64.687 | 0.71387 | 5.8857 | 7.0416 | 7.7555 |
| 11 | 50.001 | 0.87175 | 6.5301 | 67.493 | 0.74417 | 5.9368 | 7.0416 | 7.7858 |
| 12 | 55.001 | 0.96247 | 6.5361 | 70.246 | 0.77381 | 5.984 | 7.0416 | 7.8154 |
| 13 | 60.001 | 1.0512 | 6.5419 | 72.575 | 0.79875 | 6.025 | 7.0416 | 7.8404 |
| 14 | 70.001 | 1.2327 | 6.5539 | 76.862 | 0.84439 | 6.0995 | 7.0416 | 7.886 |
| 15 | 80.001 | 1.4102 | 6.5657 | 80.039 | 0.8777 | 6.1639 | 7.0416 | 7.9193 |
| 16 | 90.002 | 1.5916 | 6.5778 | 82.95 | 0.90796 | 6.2216 | 7.0416 | 7.9496 |
| 17 | 100 | 1.7691 | 6.5897 | 85.438 | 0.9335 | 6.2649 | 7.0416 | 7.9751 |
| 18 | 110 | 1.9486 | 6.6018 | 87.503 | 0.95431 | 6.3088 | 7.0416 | 7.9959 |
| 19 | 120 | 2.1281 | 6.6139 | 89.567 | 0.97504 | 6.346 | 7.0416 | 8.0166 |
| 20 | 130 | 2.3095 | 6.6262 | 91.155 | 0.99049 | 6.3777 | 7.0416 | 8.0321 |
| 21 | 140 | 2.489 | 6.6384 | 92.108 | 0.999 | 6.4038 | 7.0416 | 8.0406 |
| 22 | 150 | 2.6685 | 6.6506 | 93.008 | 1.0069 | 6.431 | 7.0416 | 8.0485 |
| 23 | 160 | 2.8499 | 6.663 | 94.067 | 1.0165 | 6.4548 | 7.0416 | 8.0581 |
| 24 | 170 | 3.0274 | 6.6752 | 94.755 | 1.022 | 6.4704 | 7.0416 | 8.0636 |
| 25 | 180 | 3.2069 | 6.6876 | 95.443 | 1.0276 | 6.4904 | 7.0416 | 8.0692 |
| 26 | 190 | 3.3923 | 6.7005 | 96.078 | 1.0324 | 6.5109 | 7.0416 | 8.074 |
| 27 | 200 | 3.5718 | 6.7129 | 96.713 | 1.0373 | 6.5198 | 7.0416 | 8.0789 |
| 28 | 210 | 3.7513 | 6.7254 | 97.243 | 1.041 | 6.537 | 7.0416 | 8.0826 |
| 29 | 220 | 3.9307 | 6.738 | 97.772 | 1.0448 | 6.5515 | 7.0416 | 8.0864 |
| [illegible] | 230 | 4.1102 | 6.7506 | 98.09 | 1.0462 | 6.5642 | 7.0416 | 8.0878 |
| [illegible] | 240 | 4.2897 | 6.7633 | 98.143 | 1.0448 | 6.5698 | 7.0416 | 8.0864 |
| 32 | 270 | 4.836 | 6.8021 | 99.043 | 1.0484 | 6.5942 | 7.0416 | 8.09 |
| 33 | 300 | 5.3745 | 6.8408 | 99.466 | 1.0469 | 6.6192 | 7.0416 | 8.0885 |
| 34 | 330 | 5.9129 | 6.88 | 99.095 | 1.0371 | 6.6331 | 7.0416 | 8.0787 |
| 35 | 360 | 6.4493 | 6.9194 | 96.184 | 1.0008 | 6.6353 | 7.0416 | 8.0424 |
| 36 | 390 | 6.9917 | 6.9598 | 93.643 | 0.96876 | 6.6442 | 7.0416 | 8.0104 |
| 37 | 420 | 7.5301 | 7.0003 | 90.467 | 0.93048 | 6.6542 | 7.0416 | 7.9721 |
| 38 | 450 | 8.0725 | 7.0416 | 88.297 | 0.90283 | 6.6625 | 7.0416 | 7.9444 |
| 39 | 480 | 8.6129 | 7.0832 | 88.138 | 0.89591 | 6.6698 | 7.0416 | 7.9375 |
| 40 | 510 | 9.1474 | 7.1249 | 87.714 | 0.88639 | 6.6753 | 7.0416 | 7.928 |
| 41 | 540 | 9.6878 | 7.1675 | 87.079 | 0.87474 | 6.6797 | 7.0416 | 7.9163 |
| 42 | 570 | 10.228 | 7.2107 | 86.973 | 0.86844 | 6.6831 | 7.0416 | 7.91 |
| 43 | 600 | 10.769 | 7.2543 | 86.338 | 0.85691 | 6.6847 | 7.0416 | 7.8985 |
| 44 | 630 | 11.303 | 7.2981 | 86.285 | 0.85126 | 6.6875 | 7.0416 | 7.8929 |
| 45 | 660 | 11.84 | 7.3425 | 86.603 | 0.84922 | 6.6903 | 7.0416 | 7.8908 |
| 46 | 690 | 12.378 | 7.3876 | 87.079 | 0.84868 | 6.6931 | 7.0416 | 7.8903 |
| 47 | 720 | 12.916 | 7.4333 | 86.973 | 0.84244 | 6.6936 | 7.0416 | 7.884 |
| 48 | 750 | 13.461 | 7.48 | 86.92 | 0.83666 | 6.6959 | 7.0416 | 7.8783 |
| 49 | 780 | 14.003 | 7.5272 | 86.073 | 0.82332 | 6.6975 | 7.0416 | 7.8649 |
| 50 | 810 | 14.546 | 7.575 | 86.338 | 0.82064 | 6.6992 | 7.0416 | 7.8622 |
| 51 | 840 | 15.084 | 7.623 | 86.814 | 0.81997 | 6.7008 | 7.0416 | 7.8616 |

# TRIAXIAL TEST

Project: RICO ARGENTINE
Boring No.: ST-2 STAGE3
Sample No.: S-6
Test No.: 12 PSI

Location: INDOT LAPOINTE DISTRICT
Tested By: BCM
Test Date: 4/18/11
Sample Type: 3 " ST

Project No.: 60157757
Checked By: WPQ
Depth: 25.0'-27.3'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED AS PER ASTM D 4767

Sp[illegible]en Height: 4.60 in
Specimen Area: 6.47 in^2
Specimen Volume: 29.79 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 73

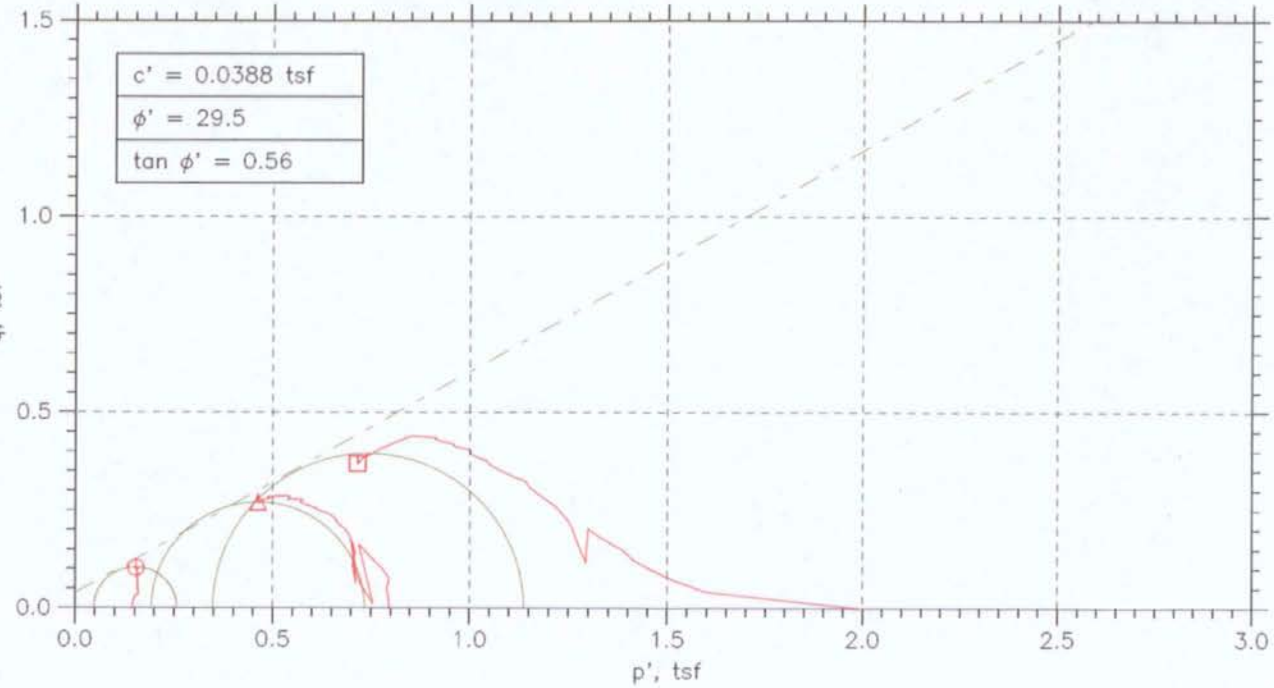
Plastic Limit: 50

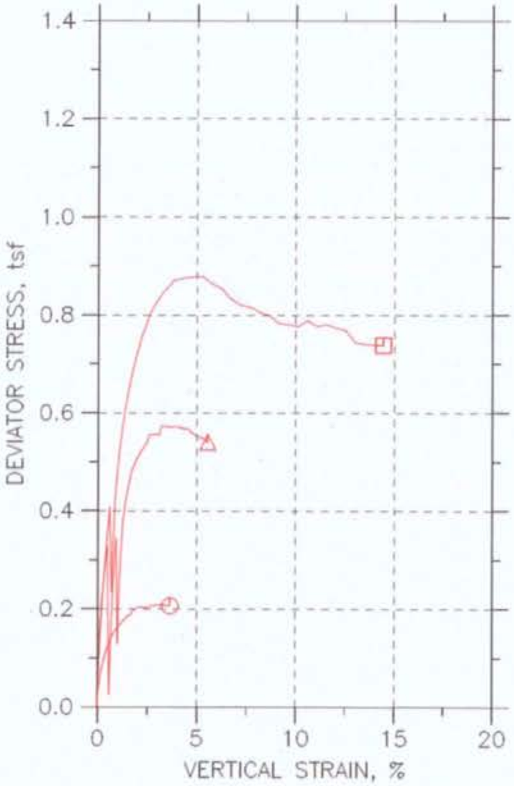
Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 7.0416 | 7.0416 | 0 | 0.000 | 1.9978 | 1.9978 | 1.000 | 1.9978 | 0 |
| 2 | 0.08 | 7.2199 | 7.0416 | 0.16992 | 0.953 | 2.0061 | 1.8279 | 1.098 | 1.917 | 0.08913 |
| 3 | 0.17 | 7.3431 | 7.0416 | 0.29431 | 0.976 | 2.005 | 1.7035 | 1.177 | 1.8542 | 0.15077 |
| 4 | 0.25 | 7.4369 | 7.0416 | 0.40204 | 1.017 | 1.991 | 1.5957 | 1.248 | 1.7934 | 0.19763 |
| 5 | 0.34 | 7.5134 | 7.0416 | 0.49644 | 1.052 | 1.9731 | 1.5013 | 1.314 | 1.7372 | 0.23589 |
| 6 | 0.43 | 7.5751 | 7.0416 | 0.57641 | 1.080 | 1.9549 | 1.4214 | 1.375 | 1.6881 | 0.26675 |
| 7 | 0.52 | 7.6326 | 7.0416 | 0.65304 | 1.105 | 1.9358 | 1.3447 | 1.439 | 1.6402 | 0.29551 |
| 8 | 0.61 | 7.6777 | 7.0416 | 0.72134 | 1.134 | 1.9126 | 1.2764 | 1.498 | 1.5945 | 0.31807 |
| 9 | 0.69 | 7.7181 | 7.0416 | 0.78464 | 1.160 | 1.8896 | 1.2131 | 1.558 | 1.5514 | 0.33825 |
| 10 | 0.78 | 7.7555 | 7.0416 | 0.84184 | 1.179 | 1.8698 | 1.1559 | 1.618 | 1.5129 | 0.35694 |
| 11 | 0.87 | 7.7858 | 7.0416 | 0.89293 | 1.200 | 1.849 | 1.1048 | 1.674 | 1.4769 | 0.37209 |
| 12 | 0.96 | 7.8154 | 7.0416 | 0.94013 | 1.215 | 1.8315 | 1.0576 | 1.732 | 1.4446 | 0.38691 |
| 13 | 1.05 | 7.8404 | 7.0416 | 0.98122 | 1.228 | 1.8153 | 1.0166 | 1.786 | 1.4159 | 0.39938 |
| 14 | 1.23 | 7.886 | 7.0416 | 1.0556 | 1.250 | 1.7865 | 0.94215 | 1.896 | 1.3643 | 0.4222 |
| 15 | 1.41 | 7.9193 | 7.0416 | 1.12 | 1.276 | 1.7554 | 0.87773 | 2.000 | 1.3166 | 0.43885 |
| 16 | 1.59 | 7.9496 | 7.0416 | 1.1778 | 1.297 | 1.7279 | 0.81998 | 2.107 | 1.274 | 0.45398 |
| 17 | 1.77 | 7.9751 | 7.0416 | 1.2211 | 1.308 | 1.7102 | 0.77666 | 2.202 | 1.2434 | 0.46675 |
| 18 | 1.95 | 7.9959 | 7.0416 | 1.265 | 1.326 | 1.6871 | 0.7328 | 2.302 | 1.21 | 0.47716 |
| 19 | 2.13 | 8.0166 | 7.0416 | 1.3022 | 1.336 | 1.6706 | 0.69559 | 2.402 | 1.1831 | 0.48752 |
| 20 | 2.31 | 8.0321 | 7.0416 | 1.3338 | 1.347 | 1.6544 | 0.66394 | 2.492 | 1.1592 | 0.49524 |
| 21 | 2.49 | 8.0406 | 7.0416 | 1.3599 | 1.361 | 1.6368 | 0.63784 | 2.566 | 1.1373 | 0.4995 |
| 22 | 2.67 | 8.0485 | 7.0416 | 1.3871 | 1.378 | 1.6175 | 0.61063 | 2.649 | 1.1141 | 0.50345 |
| 23 | 2.85 | 8.0581 | 7.0416 | 1.411 | 1.388 | 1.6032 | 0.58675 | 2.732 | 1.095 | 0.50824 |
| 24 | 3.03 | 8.0636 | 7.0416 | 1.4266 | 1.396 | 1.5932 | 0.5712 | 2.789 | 1.0822 | 0.51102 |
| 25 | 3.21 | 8.0692 | 7.0416 | 1.4466 | 1.408 | 1.5788 | 0.55121 | 2.864 | 1.065 | 0.51378 |
| 26 | 3.39 | 8.074 | 7.0416 | 1.4671 | 1.421 | 1.5631 | 0.53067 | 2.946 | 1.0469 | 0.51621 |
| 27 | 3.57 | 8.0789 | 7.0416 | 1.476 | 1.423 | 1.5591 | 0.52178 | 2.988 | 1.0404 | 0.51865 |
| 28 | 3.75 | 8.0826 | 7.0416 | 1.4932 | 1.434 | 1.5456 | 0.50457 | 3.063 | 1.0251 | 0.52052 |
| [illegible] | 3.93 | 8.0864 | 7.0416 | 1.5076 | 1.443 | 1.5349 | 0.49013 | 3.132 | 1.0125 | 0.52238 |
| [illegible] | 4.11 | 8.0878 | 7.0416 | 1.5204 | 1.453 | 1.5236 | 0.47736 | 3.192 | 1.0005 | 0.5231 |
| 31 | 4.29 | 8.0864 | 7.0416 | 1.526 | 1.461 | 1.5166 | 0.4718 | 3.214 | 0.9942 | 0.5224 |
| 32 | 4.84 | 8.09 | 7.0416 | 1.5504 | 1.479 | 1.4957 | 0.44737 | 3.343 | 0.97155 | 0.52418 |
| 33 | 5.37 | 8.0885 | 7.0416 | 1.5754 | 1.505 | 1.4693 | 0.42238 | 3.479 | 0.94582 | 0.52344 |
| 34 | 5.91 | 8.0787 | 7.0416 | 1.5893 | 1.532 | 1.4456 | 0.4085 | 3.539 | 0.92702 | 0.51853 |
| 35 | 6.45 | 8.0424 | 7.0416 | 1.5915 | 1.590 | 1.4071 | 0.40628 | 3.463 | 0.9067 | 0.50042 |
| 36 | 6.99 | 8.0104 | 7.0416 | 1.6004 | 1.652 | 1.3661 | 0.39739 | 3.438 | 0.88177 | 0.48438 |
| 37 | 7.53 | 7.9721 | 7.0416 | 1.6104 | 1.731 | 1.3179 | 0.3874 | 3.402 | 0.85264 | 0.46524 |
| 38 | 8.07 | 7.9444 | 7.0416 | 1.6187 | 1.793 | 1.2819 | 0.37907 | 3.382 | 0.83048 | 0.45141 |
| 39 | 8.61 | 7.9375 | 7.0416 | 1.6259 | 1.815 | 1.2678 | 0.37185 | 3.409 | 0.8198 | 0.44795 |
| 40 | 9.15 | 7.928 | 7.0416 | 1.6315 | 1.841 | 1.2527 | 0.3663 | 3.420 | 0.80949 | 0.44319 |
| 41 | 9.69 | 7.9163 | 7.0416 | 1.6359 | 1.870 | 1.2366 | 0.36185 | 3.417 | 0.79922 | 0.43737 |
| 42 | 10.23 | 7.91 | 7.0416 | 1.6393 | 1.888 | 1.227 | 0.35852 | 3.422 | 0.79274 | 0.43422 |
| 43 | 10.77 | 7.8985 | 7.0416 | 1.6409 | 1.915 | 1.2138 | 0.35686 | 3.401 | 0.78531 | 0.42846 |
| 44 | 11.30 | 7.8929 | 7.0416 | 1.6437 | 1.931 | 1.2053 | 0.35408 | 3.404 | 0.77971 | 0.42563 |
| 45 | 11.84 | 7.8908 | 7.0416 | 1.6465 | 1.939 | 1.2005 | 0.3513 | 3.417 | 0.77591 | 0.42461 |
| 46 | 12.38 | 7.8903 | 7.0416 | 1.6493 | 1.943 | 1.1972 | 0.34853 | 3.435 | 0.77287 | 0.42434 |
| 47 | 12.92 | 7.884 | 7.0416 | 1.6498 | 1.958 | 1.1904 | 0.34797 | 3.421 | 0.76919 | 0.42122 |
| 48 | 13.46 | 7.8783 | 7.0416 | 1.652 | 1.975 | 1.1824 | 0.34575 | 3.420 | 0.76408 | 0.41833 |
| 49 | 14.00 | 7.8649 | 7.0416 | 1.6537 | 2.009 | 1.1674 | 0.34408 | 3.393 | 0.75574 | 0.41166 |
| 50 | 14.55 | 7.8622 | 7.0416 | 1.6554 | 2.017 | 1.1631 | 0.34242 | 3.397 | 0.75274 | 0.41032 |
| 51 | 15.08 | 7.8616 | 7.0416 | 1.657 | 2.021 | 1.1607 | 0.34075 | 3.406 | 0.75074 | 0.40999 |

# TRIAXIAL COMPRESSION TEST REPORT

AECOM





| Symbol | | ○ | △ | □ | |
|---|---|---|---|---|---|
| Test No. | | 2 PSI | 11.1 PSI | 27.8 PSI | |
| Initial | Diameter, in | 2.8311 | 2.8846 | 2.9134 | |
| | Height, in | 5.9906 | 5.3016 | 4.8201 | |
| | Water Content, % | 213.55 | 210.02 | 190.13 | |
| | Dry Density, pcf | 25.13 | 25.55 | 27.8 | |
| | Saturation, % | 99.34 | 99.56 | 99.47 | |
| | Void Ratio | 6.4365 | 6.3159 | 5.723 | |
| Before Shear | Water Content, % | 210.02 | 190.13 | 165.00 | |
| | Dry Density, pcf | 25.65 | 27.93 | 31.47 | |
| | Saturation, % | 100.00 | 100.00 | 100.00 | |
| | Void Ratio | 6.288 | 5.6925 | 4.9401 | |
| | Back Press., tsf | 5.0404 | 5.0415 | 5.0437 | |
| Minor Prin. Stress, tsf | | 0.14361 | 0.79772 | 1.9979 | |
| Max. Dev. Stress, tsf | | 0.21 | 0.57402 | 0.87985 | |
| Time to Failure, min | | 235 | 225 | 330 | |
| Strain Rate, %/min | | 0.02 | 0.002 | 0.002 | |
| B-Value | | .98 | --- | --- | |
| Estimated Specific Gravity | | 2.99 | 2.99 | 2.99 | |
| Liquid Limit | | 74 | 74 | 74 | |
| Plastic Limit | | 57 | 57 | 57 | |
| Plasticity Index | | 17 | 17 | 17 | |
| Failure Sketch | |  |  |  | |

Project: RICO ARGENTINE SITE OU01
Location: RICO, CO
Project No.: 60157757
ring No.: ST-3
Sample Type: 3" ST

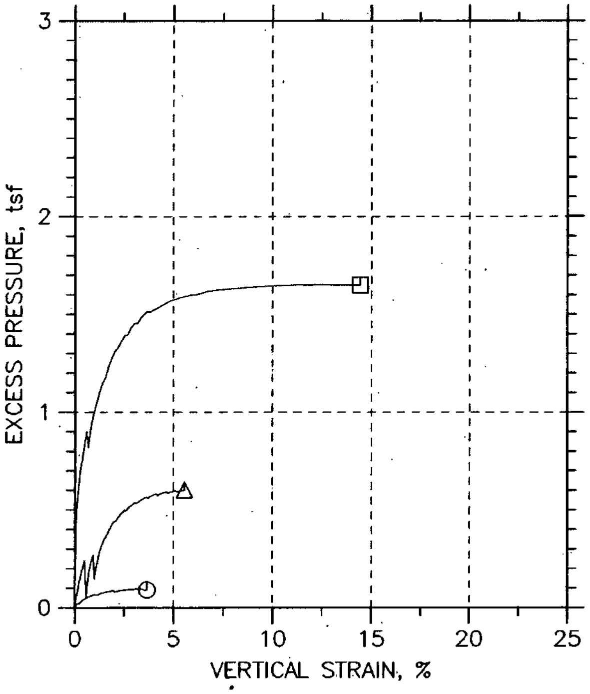
Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST

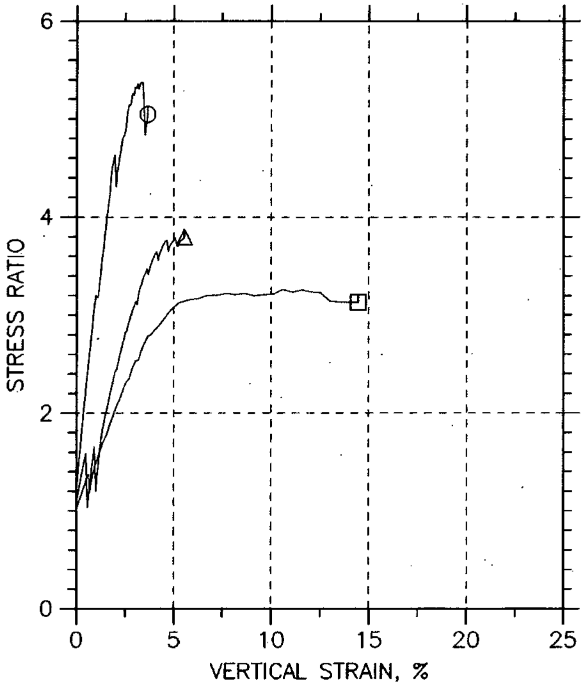
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

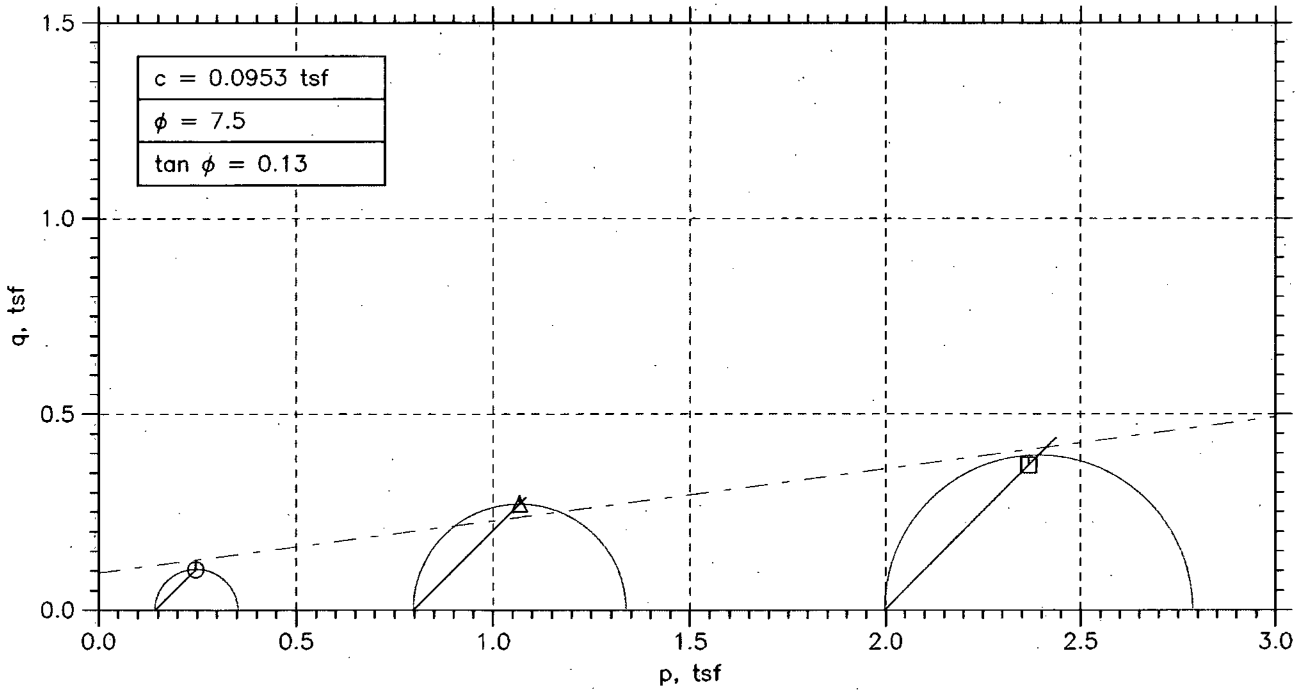
Thu, 01-DEC-2011 13:40:31

# TRIAXIAL COMPRESSION TEST REPORT

AECOM







| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-3 | Test Date: 11/22/11 | Depth: 2.0'-4.0' |
| st No.: ST-3 | Sample Type: 3" ST | Elevation: ---- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST | | |
| Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767. | | |
| | | |

Thu, 01-DEC-2011 13:41:19

# TRIAXIAL TEST

AECOM

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3
Sample No.: ST-3
Test No.: 2 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/22/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 5.99 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.71 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.2951 | 0 | 0 | 5.0404 | 5.184 | 5.184 |
| 2 | 2.004 | 0.025692 | 6.2967 | 1.8882 | 0.02159 | 5.0485 | 5.184 | 5.2056 |
| 3 | 4.0041 | 0.051383 | 6.2983 | 2.8323 | 0.032377 | 5.0529 | 5.184 | 5.2164 |
| 4 | 6.0041 | 0.077075 | 6.2999 | 3.619 | 0.04136 | 5.0562 | 5.184 | 5.2254 |
| 5 | 8.0041 | 0.10419 | 6.3016 | 4.3533 | 0.049739 | 5.0589 | 5.184 | 5.2337 |
| 6 | 10.004 | 0.12846 | 6.3032 | 4.9827 | 0.056916 | 5.0616 | 5.184 | 5.2409 |
| 7 | 12 | 0.15558 | 6.3049 | 5.6121 | 0.064088 | 5.0621 | 5.184 | 5.2481 |
| 8 | 14 | 0.17984 | 6.3064 | 6.1365 | 0.070061 | 5.061 | 5.184 | 5.2541 |
| 9 | 16 | 0.20553 | 6.308 | 6.6086 | 0.07543 | 5.061 | 5.184 | 5.2594 |
| 10 | 18 | 0.23122 | 6.3097 | 7.0806 | 0.080797 | 5.0643 | 5.184 | 5.2648 |
| 11 | 20 | 0.25692 | 6.3113 | 7.4478 | 0.084965 | 5.0665 | 5.184 | 5.269 |
| 12 | 22 | 0.28404 | 6.313 | 7.8674 | 0.089727 | 5.0687 | 5.184 | 5.2737 |
| 13 | 24 | 0.30973 | 6.3146 | 8.287 | 0.094489 | 5.0719 | 5.184 | 5.2785 |
| 14 | 26 | 0.33685 | 6.3164 | 8.6541 | 0.098648 | 5.0741 | 5.184 | 5.2826 |
| 15 | 28 | 0.36111 | 6.3179 | 9.0737 | 0.10341 | 5.0763 | 5.184 | 5.2874 |
| 16 | 30 | 0.38823 | 6.3196 | 9.3884 | 0.10696 | 5.0784 | 5.184 | 5.291 |
| 17 | 35 | 0.45389 | 6.3238 | 10.175 | 0.11585 | 5.0828 | 5.184 | 5.2998 |
| 18 | 40.001 | 0.51669 | 6.3278 | 10.805 | 0.12294 | 5.0871 | 5.184 | 5.3069 |
| 19 | 45.001 | 0.58092 | 6.3319 | 11.486 | 0.13061 | 5.0904 | 5.184 | 5.3146 |
| 20 | 50.001 | 0.64515 | 6.336 | 12.063 | 0.13708 | 5.0937 | 5.184 | 5.3211 |
| 21 | 55.001 | 0.70652 | 6.3399 | 12.535 | 0.14236 | 5.0969 | 5.184 | 5.3264 |
| 22 | 60.001 | 0.77075 | 6.344 | 13.007 | 0.14763 | 5.0996 | 5.184 | 5.3316 |
| 23 | 65.001 | 0.83212 | 6.3479 | 13.375 | 0.1517 | 5.1023 | 5.184 | 5.3357 |
| 24 | 70.001 | 0.89778 | 6.3521 | 13.847 | 0.15695 | 5.1056 | 5.184 | 5.3409 |
| 25 | 75.001 | 0.96058 | 6.3561 | 14.214 | 0.16101 | 5.1078 | 5.184 | 5.345 |
| 26 | 80.001 | 1.0234 | 6.3602 | 14.476 | 0.16387 | 5.1094 | 5.184 | 5.3479 |
| 27 | 85.001 | 1.0862 | 6.3642 | 14.791 | 0.16733 | 5.1072 | 5.184 | 5.3513 |
| 28 | 90.001 | 1.1504 | 6.3683 | 15.053 | 0.17019 | 5.1067 | 5.184 | 5.3542 |
| 29 | 95.002 | 1.2132 | 6.3724 | 15.263 | 0.17245 | 5.11 | 5.184 | 5.3564 |
| [illegible] | 100 | 1.2789 | 6.3766 | 15.577 | 0.17589 | 5.1127 | 5.184 | 5.3599 |
| [illegible] | 105 | 1.3431 | 6.3808 | 15.84 | 0.17873 | 5.1148 | 5.184 | 5.3627 |
| 32 | 110 | 1.4102 | 6.3851 | 16.102 | 0.18157 | 5.1165 | 5.184 | 5.3656 |
| 33 | 115 | 1.4758 | 6.3894 | 16.364 | 0.1844 | 5.1186 | 5.184 | 5.3684 |
| 34 | 120 | 1.5372 | 6.3934 | 16.574 | 0.18665 | 5.1203 | 5.184 | 5.3707 |
| 35 | 125 | 1.6 | 6.3974 | 16.731 | 0.1883 | 5.1219 | 5.184 | 5.3723 |
| 36 | 130 | 1.6657 | 6.4017 | 16.889 | 0.18995 | 5.1235 | 5.184 | 5.3739 |
| 37 | 135 | 1.7299 | 6.4059 | 17.046 | 0.19159 | 5.1246 | 5.184 | 5.3756 |
| 38 | 140 | 1.7927 | 6.41 | 17.728 | 0.19913 | 5.1257 | 5.184 | 5.3831 |
| 39 | 145 | 1.8569 | 6.4142 | 17.938 | 0.20135 | 5.1268 | 5.184 | 5.3854 |
| 40 | 150 | 1.9197 | 6.4183 | 17.885 | 0.20063 | 5.1279 | 5.184 | 5.3846 |
| 41 | 155 | 1.984 | 6.4225 | 18.042 | 0.20227 | 5.1284 | 5.184 | 5.3863 |
| 42 | 160 | 2.0496 | 6.4268 | 18.2 | 0.20389 | 5.1225 | 5.184 | 5.3879 |
| 43 | 165 | 2.1153 | 6.4311 | 18.357 | 0.20552 | 5.1246 | 5.184 | 5.3895 |
| 44 | 170 | 2.1809 | 6.4354 | 18.305 | 0.20479 | 5.1263 | 5.184 | 5.3888 |
| 45 | 175 | 2.2452 | 6.4397 | 18.2 | 0.20349 | 5.1279 | 5.184 | 5.3875 |
| 46 | 180 | 2.3137 | 6.4442 | 18.305 | 0.20452 | 5.129 | 5.184 | 5.3885 |
| 47 | 185 | 2.3779 | 6.4484 | 18.357 | 0.20497 | 5.1301 | 5.184 | 5.389 |
| 48 | 190 | 2.4436 | 6.4528 | 18.305 | 0.20424 | 5.1306 | 5.184 | 5.3882 |
| 49 | 195 | 2.5092 | 6.4571 | 18.305 | 0.20411 | 5.1311 | 5.184 | 5.3881 |
| 50 | 200 | 2.5734 | 6.4614 | 18.357 | 0.20456 | 5.1322 | 5.184 | 5.3886 |
| 51 | 205 | 2.6391 | 6.4657 | 18.515 | 0.20617 | 5.1333 | 5.184 | 5.3902 |
| 52 | 210 | 2.7048 | 6.4701 | 18.672 | 0.20778 | 5.1339 | 5.184 | 5.3918 |
| 53 | 215 | 2.7704 | 6.4744 | 18.672 | 0.20764 | 5.1339 | 5.184 | 5.3916 |
| 54 | 220 | 2.8346 | 6.4787 | 18.672 | 0.20751 | 5.1344 | 5.184 | 5.3915 |
| 55 | 225 | 2.8989 | 6.483 | 18.829 | 0.20912 | 5.135 | 5.184 | 5.3931 |
| 56 | 230 | 2.9645 | 6.4874 | 18.777 | 0.20839 | 5.135 | 5.184 | 5.3924 |
| 57 | 235 | 3.0302 | 6.4918 | 18.934 | 0.21 | 5.1355 | 5.184 | 5.394 |
| 58 | 240 | 3.093 | 6.496 | 18.882 | 0.20928 | 5.1355 | 5.184 | 5.3933 |
| 59 | 245 | 3.1586 | 6.5004 | 18.882 | 0.20914 | 5.136 | 5.184 | 5.3931 |
| 60 | 250 | 3.2214 | 6.5046 | 18.882 | 0.209 | 5.1355 | 5.184 | 5.393 |
| 61 | 255 | 3.2871 | 6.509 | 18.934 | 0.20944 | 5.136 | 5.184 | 5.3934 |
| 62 | 260 | 3.3499 | 6.5133 | 18.987 | 0.20988 | 5.136 | 5.184 | 5.3939 |
| 63 | 265 | 3.4141 | 6.5176 | 18.987 | 0.20975 | 5.136 | 5.184 | 5.3937 |
| 64 | 270 | 3.4784 | 6.5219 | 18.829 | 0.20787 | 5.1339 | 5.184 | 5.3919 |
| 65 | 275 | 3.5426 | 6.5263 | 18.777 | 0.20715 | 5.1301 | 5.184 | 5.3912 |
| 66 | 280 | 3.6068 | 6.5306 | 18.829 | 0.20759 | 5.1317 | 5.184 | 5.3916 |
| 67 | 285 | 3.6696 | 6.5349 | 18.829 | 0.20746 | 5.1328 | 5.184 | 5.3915 |
| 68 | 285.36 | 3.6739 | 6.5352 | 18.829 | 0.20745 | 5.1328 | 5.184 | 5.3914 |

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST-3 | Test Date: 11/22/11 | Depth: 2.0'-4.0' |
| Test No.: 2 PSI | Sample Type: 3" ST | Elevation: ---- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
R[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

| | | |
|---|---|---|
| Spe[illegible]men Height: 5.99 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.30 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 37.71 in^3 | Piston Weight: 0.00 lb | Correction Type: Uniform |

| | | |
|---|---|---|
| Liquid Limit: 74 | Plastic Limit: 57 | Estimated Specific Gravity: 2.99 |

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.184 | 5.184 | 0 | 0.000 | 0.14361 | 0.14361 | 1.000 | 0.14361 | 0 |
| 2 | 0.03 | 5.2056 | 5.184 | 0.0081516 | 0.378 | 0.15704 | 0.13545 | 1.159 | 0.14625 | 0.010795 |
| 3 | 0.05 | 5.2164 | 5.184 | 0.012499 | 0.386 | 0.16348 | 0.13111 | 1.247 | 0.1473 | 0.016189 |
| 4 | 0.08 | 5.2254 | 5.184 | 0.01576 | 0.381 | 0.16921 | 0.12785 | 1.324 | 0.14853 | 0.02068 |
| 5 | 0.10 | 5.2337 | 5.184 | 0.018477 | 0.371 | 0.17487 | 0.12513 | 1.397 | 0.15 | 0.024869 |
| 6 | 0.13 | 5.2409 | 5.184 | 0.021194 | 0.372 | 0.17933 | 0.12241 | 1.465 | 0.15087 | 0.028458 |
| 7 | 0.16 | 5.2481 | 5.184 | 0.021738 | 0.339 | 0.18596 | 0.12187 | 1.526 | 0.15391 | 0.032044 |
| 8 | 0.18 | 5.2541 | 5.184 | 0.020651 | 0.295 | 0.19302 | 0.12296 | 1.570 | 0.15799 | 0.03503 |
| 9 | 0.21 | 5.2594 | 5.184 | 0.020651 | 0.274 | 0.19839 | 0.12296 | 1.613 | 0.16067 | 0.037715 |
| 10 | 0.23 | 5.2648 | 5.184 | 0.023911 | 0.296 | 0.20049 | 0.11969 | 1.675 | 0.16009 | 0.040399 |
| 11 | 0.26 | 5.269 | 5.184 | 0.026085 | 0.307 | 0.20249 | 0.11752 | 1.723 | 0.16 | 0.042483 |
| 12 | 0.28 | 5.2737 | 5.184 | 0.028259 | 0.315 | 0.20507 | 0.11535 | 1.778 | 0.16021 | 0.044864 |
| 13 | 0.31 | 5.2785 | 5.184 | 0.031519 | 0.334 | 0.20658 | 0.11209 | 1.843 | 0.15933 | 0.047244 |
| 14 | 0.34 | 5.2826 | 5.184 | 0.033693 | 0.342 | 0.20856 | 0.10991 | 1.898 | 0.15924 | 0.049324 |
| 15 | 0.36 | 5.2874 | 5.184 | 0.035867 | 0.347 | 0.21114 | 0.10774 | 1.960 | 0.15944 | 0.051703 |
| 16 | 0.39 | 5.291 | 5.184 | 0.038041 | 0.356 | 0.21253 | 0.10557 | 2.013 | 0.15905 | 0.053481 |
| 17 | 0.45 | 5.2998 | 5.184 | 0.042388 | 0.366 | 0.21707 | 0.10122 | 2.145 | 0.15914 | 0.057925 |
| 18 | 0.52 | 5.3069 | 5.184 | 0.046736 | 0.380 | 0.21981 | 0.09687 | 2.269 | 0.15834 | 0.061469 |
| 19 | 0.58 | 5.3146 | 5.184 | 0.049996 | 0.383 | 0.22422 | 0.09361 | 2.395 | 0.15892 | 0.065306 |
| 20 | 0.65 | 5.3211 | 5.184 | 0.053257 | 0.388 | 0.22743 | 0.090349 | 2.517 | 0.15889 | 0.068542 |
| 21 | 0.71 | 5.3264 | 5.184 | 0.056518 | 0.397 | 0.22945 | 0.087088 | 2.635 | 0.15827 | 0.07118 |
| 22 | 0.77 | 5.3316 | 5.184 | 0.059235 | 0.401 | 0.232 | 0.084371 | 2.750 | 0.15818 | 0.073813 |
| 23 | 0.83 | 5.3357 | 5.184 | 0.061952 | 0.408 | 0.23335 | 0.081654 | 2.858 | 0.1575 | 0.075849 |
| 24 | 0.90 | 5.3409 | 5.184 | 0.065213 | 0.416 | 0.23534 | 0.078393 | 3.002 | 0.15687 | 0.078474 |
| 25 | 0.96 | 5.345 | 5.184 | 0.067386 | 0.419 | 0.23723 | 0.076219 | 3.112 | 0.15672 | 0.080504 |
| 26 | 1.02 | 5.3479 | 5.184 | 0.069017 | 0.421 | 0.23846 | 0.074589 | 3.197 | 0.15653 | 0.081937 |
| 27 | 1.09 | 5.3513 | 5.184 | 0.066843 | 0.399 | 0.24409 | 0.076763 | 3.180 | 0.16043 | 0.083665 |
| 28 | 1.15 | 5.3542 | 5.184 | 0.0663 | 0.390 | 0.24749 | 0.077306 | 3.201 | 0.1624 | 0.085093 |
| [illegible] | 1.21 | 5.3564 | 5.184 | 0.06956 | 0.403 | 0.24649 | 0.074046 | 3.329 | 0.16027 | 0.086225 |
| [illegible] | 1.28 | 5.3599 | 5.184 | 0.072277 | 0.411 | 0.24722 | 0.071329 | 3.466 | 0.15927 | 0.087944 |
| 31 | 1.34 | 5.3627 | 5.184 | 0.074451 | 0.417 | 0.24789 | 0.069155 | 3.585 | 0.15852 | 0.089366 |
| 32 | 1.41 | 5.3656 | 5.184 | 0.076081 | 0.419 | 0.24909 | 0.067524 | 3.689 | 0.15831 | 0.090784 |
| 33 | 1.48 | 5.3684 | 5.184 | 0.078255 | 0.424 | 0.24975 | 0.065351 | 3.822 | 0.15755 | 0.092201 |
| 34 | 1.54 | 5.3707 | 5.184 | 0.079885 | 0.428 | 0.25037 | 0.06372 | 3.929 | 0.15705 | 0.093325 |
| 35 | 1.60 | 5.3723 | 5.184 | 0.081516 | 0.433 | 0.25039 | 0.06209 | 4.033 | 0.15624 | 0.094151 |
| 36 | 1.67 | 5.3739 | 5.184 | 0.083146 | 0.438 | 0.25041 | 0.06046 | 4.142 | 0.15543 | 0.094973 |
| 37 | 1.73 | 5.3756 | 5.184 | 0.084233 | 0.440 | 0.25096 | 0.059373 | 4.227 | 0.15517 | 0.095795 |
| 38 | 1.79 | 5.3831 | 5.184 | 0.08532 | 0.428 | 0.25741 | 0.058286 | 4.416 | 0.15785 | 0.099563 |
| 39 | 1.86 | 5.3854 | 5.184 | 0.086407 | 0.429 | 0.25855 | 0.057199 | 4.520 | 0.15787 | 0.10068 |
| 40 | 1.92 | 5.3846 | 5.184 | 0.087494 | 0.436 | 0.25675 | 0.056112 | 4.576 | 0.15643 | 0.10032 |
| 41 | 1.98 | 5.3863 | 5.184 | 0.088037 | 0.435 | 0.25784 | 0.055569 | 4.640 | 0.1567 | 0.10113 |
| 42 | 2.05 | 5.3879 | 5.184 | 0.082059 | 0.402 | 0.26544 | 0.061547 | 4.313 | 0.16349 | 0.10195 |
| 43 | 2.12 | 5.3895 | 5.184 | 0.084233 | 0.410 | 0.26489 | 0.059373 | 4.462 | 0.16213 | 0.10276 |
| 44 | 2.18 | 5.3888 | 5.184 | 0.085863 | 0.419 | 0.26254 | 0.057743 | 4.547 | 0.16014 | 0.1024 |
| 45 | 2.25 | 5.3875 | 5.184 | 0.087494 | 0.430 | 0.2596 | 0.056112 | 4.626 | 0.15786 | 0.10174 |
| 46 | 2.31 | 5.3885 | 5.184 | 0.088581 | 0.433 | 0.25954 | 0.055025 | 4.717 | 0.15728 | 0.10226 |
| 47 | 2.38 | 5.389 | 5.184 | 0.089667 | 0.437 | 0.25891 | 0.053938 | 4.800 | 0.15642 | 0.10248 |
| 48 | 2.44 | 5.3882 | 5.184 | 0.090211 | 0.442 | 0.25764 | 0.053395 | 4.825 | 0.15552 | 0.10212 |
| 49 | 2.51 | 5.3881 | 5.184 | 0.090754 | 0.445 | 0.25696 | 0.052852 | 4.862 | 0.15491 | 0.10205 |
| 50 | 2.57 | 5.3886 | 5.184 | 0.091841 | 0.449 | 0.25632 | 0.051765 | 4.952 | 0.15404 | 0.10228 |
| 51 | 2.64 | 5.3902 | 5.184 | 0.092928 | 0.451 | 0.25685 | 0.050678 | 5.068 | 0.15376 | 0.10309 |
| 52 | 2.70 | 5.3918 | 5.184 | 0.093471 | 0.450 | 0.25792 | 0.050134 | 5.145 | 0.15403 | 0.10389 |
| 53 | 2.77 | 5.3916 | 5.184 | 0.093471 | 0.450 | 0.25778 | 0.050134 | 5.142 | 0.15396 | 0.10382 |
| 54 | 2.83 | 5.3915 | 5.184 | 0.094015 | 0.453 | 0.2571 | 0.049591 | 5.184 | 0.15334 | 0.10375 |
| 55 | 2.90 | 5.3931 | 5.184 | 0.094558 | 0.452 | 0.25816 | 0.049048 | 5.264 | 0.15361 | 0.10456 |
| 56 | 2.96 | 5.3924 | 5.184 | 0.094558 | 0.454 | 0.25744 | 0.049048 | 5.249 | 0.15324 | 0.1042 |
| 57 | 3.03 | 5.394 | 5.184 | 0.095102 | 0.453 | 0.2585 | 0.048504 | 5.329 | 0.1535 | 0.105 |
| 58 | 3.09 | 5.3933 | 5.184 | 0.095102 | 0.454 | 0.25778 | 0.048504 | 5.315 | 0.15314 | 0.10464 |
| 59 | 3.16 | 5.3931 | 5.184 | 0.095645 | 0.457 | 0.2571 | 0.047961 | 5.361 | 0.15253 | 0.10457 |
| 60 | 3.22 | 5.393 | 5.184 | 0.095102 | 0.455 | 0.25751 | 0.048504 | 5.309 | 0.15301 | 0.1045 |
| 61 | 3.29 | 5.3934 | 5.184 | 0.095645 | 0.457 | 0.2574 | 0.047961 | 5.367 | 0.15268 | 0.10472 |
| 62 | 3.35 | 5.3939 | 5.184 | 0.095645 | 0.456 | 0.25785 | 0.047961 | 5.376 | 0.1529 | 0.10494 |
| 63 | 3.41 | 5.3937 | 5.184 | 0.095645 | 0.456 | 0.25771 | 0.047961 | 5.373 | 0.15283 | 0.10487 |
| 64 | 3.48 | 5.3919 | 5.184 | 0.093471 | 0.450 | 0.258 | 0.050134 | 5.146 | 0.15407 | 0.10393 |
| 65 | 3.54 | 5.3912 | 5.184 | 0.089667 | 0.433 | 0.26109 | 0.053938 | 4.841 | 0.15751 | 0.10358 |
| 66 | 3.61 | 5.3916 | 5.184 | 0.091298 | 0.440 | 0.2599 | 0.052308 | 4.969 | 0.1561 | 0.1038 |
| 67 | 3.67 | 5.3915 | 5.184 | 0.092385 | 0.445 | 0.25868 | 0.051221 | 5.050 | 0.15495 | 0.10373 |
| 68 | 3.67 | 5.3914 | 5.184 | 0.092385 | 0.445 | 0.25867 | 0.051221 | 5.050 | 0.15494 | 0.10372 |

# TRIAXIAL TEST

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, CO | Project No.: 60157757 |
| Boring No.: ST-3 STAGE2 | Tested By: BCM | Checked By: WPQ |
| Sample No.: STAGE 2 | Test Date: 11/28/11 | Depth: 2.0'-4.0' |
| Test No.: 11.1 PSI | Sample Type: 3" ST | Elevation: ---- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

| | | |
|---|---|---|
| Specimen Height: 5.30 in | Piston Area: 0.00 in^2 | Filter Strip Correction: 0.00 tsf |
| Specimen Area: 6.54 in^2 | Piston Friction: 0.00 lb | Membrane Correction: 0.00 lb/in |
| Specimen Volume: 34.65 in^3 | Piston Weight: 0.00 lb | Correction Type: Uniform |
| Liquid Limit: 74 | Plastic Limit: 57 | Estimated Specific Gravity: 2.99 |

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.5354 | 0 | 0 | 5.0415 | 5.8392 | 5.8392 |
| 2 | 2.004 | 0.027418 | 6.5372 | 3.9337 | 0.043325 | 5.0643 | 5.8392 | 5.8825 |
| 3 | 4.0038 | 0.056448 | 6.5391 | 6.8708 | 0.075652 | 5.0833 | 5.8392 | 5.9149 |
| 4 | 6.0038 | 0.083866 | 6.5409 | 9.4933 | 0.1045 | 5.1007 | 5.8392 | 5.9437 |
| 5 | 8.0038 | 0.11451 | 6.5429 | 11.958 | 0.13159 | 5.1094 | 5.8392 | 5.9708 |
| 6 | 10.004 | 0.14193 | 6.5447 | 14.266 | 0.15695 | 5.1214 | 5.8392 | 5.9961 |
| 7 | 12.004 | 0.17096 | 6.5466 | 16.207 | 0.17824 | 5.1398 | 5.8392 | 6.0174 |
| 8 | 14.004 | 0.19999 | 6.5485 | 17.938 | 0.19722 | 5.1556 | 5.8392 | 6.0364 |
| 9 | 16.004 | 0.22902 | 6.5504 | 19.354 | 0.21273 | 5.1703 | 5.8392 | 6.0519 |
| 10 | 18.004 | 0.25805 | 6.5523 | 20.665 | 0.22708 | 5.1844 | 5.8392 | 6.0663 |
| 11 | 20.004 | 0.28708 | 6.5543 | 21.871 | 0.24026 | 5.198 | 5.8392 | 6.0795 |
| 12 | 22.004 | 0.31772 | 6.5563 | 23.078 | 0.25343 | 5.2105 | 5.8392 | 6.0926 |
| 13 | 24.004 | 0.34675 | 6.5582 | 24.179 | 0.26545 | 5.2235 | 5.8392 | 6.1047 |
| 14 | 26.004 | 0.37578 | 6.5601 | 25.28 | 0.27746 | 5.2349 | 5.8392 | 6.1167 |
| 15 | 28 | 0.40481 | 6.562 | 26.329 | 0.28889 | 5.2464 | 5.8392 | 6.1281 |
| 16 | 30 | 0.43223 | 6.5638 | 27.536 | 0.30205 | 5.2578 | 5.8392 | 6.1412 |
| 17 | 35 | 0.50642 | 6.5687 | 29.896 | 0.32769 | 5.2833 | 5.8392 | 6.1669 |
| 18 | 40 | 0.59351 | 6.5745 | 2.5176 | 0.027571 | 5.0975 | 5.8392 | 5.8668 |
| 19 | 45 | 0.66286 | 6.5791 | 11.486 | 0.1257 | 5.1779 | 5.8392 | 5.9649 |
| 20 | 50 | 0.72899 | 6.5834 | 17.675 | 0.19331 | 5.223 | 5.8392 | 6.0325 |
| 21 | 55 | 0.79834 | 6.588 | 23.13 | 0.25279 | 5.2561 | 5.8392 | 6.092 |
| 22 | 60.001 | 0.87091 | 6.5929 | 28.008 | 0.30587 | 5.2855 | 5.8392 | 6.1451 |
| 23 | 65.001 | 0.94349 | 6.5977 | 31.837 | 0.34743 | 5.3121 | 5.8392 | 6.1866 |
| 24 | 70.001 | 1.0161 | 6.6025 | 12.011 | 0.13098 | 5.1915 | 5.8392 | 5.9702 |
| 25 | 75.001 | 1.0838 | 6.607 | 20.35 | 0.22177 | 5.2464 | 5.8392 | 6.061 |
| 26 | 80.001 | 1.1515 | 6.6116 | 26.434 | 0.28787 | 5.2714 | 5.8392 | 6.1271 |
| 27 | 85.001 | 1.2209 | 6.6162 | 31.365 | 0.34132 | 5.3072 | 5.8392 | 6.1805 |
| 28 | 90.001 | 1.2919 | 6.621 | 34.931 | 0.37986 | 5.3344 | 5.8392 | 6.2191 |
| 29 | 95.001 | 1.3628 | 6.6257 | 37.344 | 0.4058 | 5.3572 | 5.8392 | 6.245 |
| [illegible] | 100 | 1.4322 | 6.6304 | 38.917 | 0.42261 | 5.3762 | 5.8392 | 6.2618 |
| [illegible] | 105 | 1.5015 | 6.6351 | 40.438 | 0.43881 | 5.3931 | 5.8392 | 6.278 |
| 32 | 110 | 1.5741 | 6.64 | 41.749 | 0.45271 | 5.4023 | 5.8392 | 6.2919 |
| 33 | 115 | 1.6467 | 6.6449 | 43.113 | 0.46715 | 5.417 | 5.8392 | 6.3064 |
| 34 | 120 | 1.7176 | 6.6497 | 44.372 | 0.48044 | 5.4328 | 5.8392 | 6.3196 |
| 35 | 125 | 1.7918 | 6.6547 | 45.211 | 0.48916 | 5.4469 | 5.8392 | 6.3284 |
| 36 | 130 | 1.866 | 6.6597 | 45.736 | 0.49446 | 5.4599 | 5.8392 | 6.3337 |
| 37 | 135 | 1.937 | 6.6645 | 46.522 | 0.5026 | 5.4724 | 5.8392 | 6.3418 |
| 38 | 140 | 2.0079 | 6.6694 | 47.204 | 0.5096 | 5.4833 | 5.8392 | 6.3488 |
| 39 | 145 | 2.0805 | 6.6743 | 47.624 | 0.51375 | 5.4849 | 5.8392 | 6.3529 |
| 40 | 150 | 2.1547 | 6.6794 | 47.991 | 0.51732 | 5.4963 | 5.8392 | 6.3565 |
| 41 | 155 | 2.2289 | 6.6844 | 48.778 | 0.5254 | 5.5072 | 5.8392 | 6.3646 |
| 42 | 160 | 2.3031 | 6.6895 | 49.04 | 0.52782 | 5.5164 | 5.8392 | 6.367 |
| 43 | 165 | 2.3773 | 6.6946 | 49.722 | 0.53476 | 5.5257 | 5.8392 | 6.374 |
| 44 | 170 | 2.4515 | 6.6997 | 50.089 | 0.53829 | 5.5333 | 5.8392 | 6.3775 |
| 45 | 175 | 2.5273 | 6.7049 | 50.718 | 0.54463 | 5.5409 | 5.8392 | 6.3838 |
| 46 | 180 | 2.6031 | 6.7101 | 51.715 | 0.5549 | 5.5387 | 5.8392 | 6.3941 |
| 47 | 185 | 2.6789 | 6.7153 | 51.977 | 0.55728 | 5.548 | 5.8392 | 6.3965 |
| 48 | 190 | 2.7531 | 6.7205 | 51.977 | 0.55686 | 5.5556 | 5.8392 | 6.3961 |
| 49 | 195 | 2.8256 | 6.7255 | 52.03 | 0.55701 | 5.5621 | 5.8392 | 6.3962 |
| 50 | 200 | 2.9014 | 6.7307 | 52.187 | 0.55825 | 5.5681 | 5.8392 | 6.3975 |
| 51 | 205 | 2.9756 | 6.7359 | 52.134 | 0.55727 | 5.5735 | 5.8392 | 6.3965 |
| 52 | 210 | 3.0498 | 6.741 | 52.134 | 0.55684 | 5.5789 | 5.8392 | 6.396 |
| 53 | 215 | 3.1256 | 6.7463 | 52.082 | 0.55585 | 5.5757 | 5.8392 | 6.395 |
| 54 | 220 | 3.1982 | 6.7514 | 53.655 | 0.57221 | 5.5806 | 5.8392 | 6.4114 |
| 55 | 225 | 3.2708 | 6.7564 | 53.865 | 0.57402 | 5.5871 | 5.8392 | 6.4132 |
| 56 | 230 | 3.3433 | 6.7615 | 53.865 | 0.57359 | 5.5914 | 5.8392 | 6.4128 |
| 57 | 235 | 3.4159 | 6.7666 | 53.865 | 0.57315 | 5.5963 | 5.8392 | 6.4124 |
| 58 | 240 | 3.4869 | 6.7716 | 53.97 | 0.57385 | 5.6007 | 5.8392 | 6.413 |
| 59 | 245 | 3.5611 | 6.7768 | 53.813 | 0.57174 | 5.6045 | 5.8392 | 6.4109 |
| 60 | 250 | 3.632 | 6.7818 | 53.918 | 0.57243 | 5.6077 | 5.8392 | 6.4116 |
| 61 | 255 | 3.7062 | 6.787 | 53.97 | 0.57254 | 5.6023 | 5.8392 | 6.4117 |
| 62 | 260 | 3.7788 | 6.7921 | 54.023 | 0.57267 | 5.6088 | 5.8392 | 6.4119 |
| 63 | 265 | 3.8514 | 6.7972 | 54.127 | 0.57335 | 5.6126 | 5.8392 | 6.4125 |
| 64 | 270 | 3.9207 | 6.8021 | 54.127 | 0.57293 | 5.6159 | 5.8392 | 6.4121 |
| 65 | 275 | 3.9949 | 6.8074 | 54.075 | 0.57194 | 5.6192 | 5.8392 | 6.4111 |
| 66 | 280 | 4.0675 | 6.8125 | 54.075 | 0.57151 | 5.6219 | 5.8392 | 6.4107 |
| 67 | 285 | 4.1417 | 6.8178 | 53.97 | 0.56996 | 5.624 | 5.8392 | 6.4092 |
| 68 | 290 | 4.2143 | 6.823 | 54.285 | 0.57284 | 5.6159 | 5.8392 | 6.412 |
| 69 | 295 | 4.2884 | 6.8283 | 53.97 | 0.56908 | 5.623 | 5.8392 | 6.4083 |
| 70 | 300 | 4.3642 | 6.8337 | 53.97 | 0.56863 | 5.6257 | 5.8392 | 6.4078 |
| [illegible] | 305 | 4.4368 | 6.8389 | 54.023 | 0.56875 | 5.6289 | 5.8392 | 6.408 |
| [illegible] | 310 | 4.5094 | 6.8441 | 54.023 | 0.56832 | 5.6311 | 5.8392 | 6.4075 |
| 73 | 315 | 4.5852 | 6.8495 | 54.023 | 0.56787 | 5.6333 | 5.8392 | 6.4071 |
| 74 | 320 | 4.6594 | 6.8548 | 53.813 | 0.56522 | 5.6349 | 5.8392 | 6.4044 |
| 75 | 325 | 4.7304 | 6.8599 | 53.603 | 0.5626 | 5.6273 | 5.8392 | 6.4018 |
| 76 | 330 | 4.8029 | 6.8652 | 53.236 | 0.55832 | 5.6327 | 5.8392 | 6.3975 |
| 77 | 335 | 4.8787 | 6.8706 | 53.288 | 0.55843 | 5.6349 | 5.8392 | 6.3976 |
| 78 | 340 | 4.9513 | 6.8759 | 53.078 | 0.5558 | 5.6371 | 5.8392 | 6.395 |
| 79 | 345 | 5.0255 | 6.8813 | 52.974 | 0.55427 | 5.6387 | 5.8392 | 6.3935 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 80 | 350 | 5.1029 | 6.8869 | 52.974 | 0.55382 | 5.6409 | 5.8392 | 6.393 |
| 81 | 355 | 5.1787 | 6.8924 | 52.554 | 0.549 | 5.6365 | 5.8392 | 6.3882 |
| 82 | 360 | 5.2529 | 6.8978 | 52.659 | 0.54966 | 5.636 | 5.8392 | 6.3889 |
| 83 | 365 | 5.3271 | 6.9032 | 52.711 | 0.54978 | 5.6398 | 5.8392 | 6.389 |
| 84 | 370 | 5.4029 | 6.9087 | 52.292 | 0.54497 | 5.642 | 5.8392 | 6.3842 |
| 85 | 375 | 5.4787 | 6.9143 | 52.187 | 0.54344 | 5.6436 | 5.8392 | 6.3826 |
| 86 | 380 | 5.5529 | 6.9197 | 52.03 | 0.54137 | 5.6452 | 5.8392 | 6.3806 |
| 87 | 381.27 | 5.5706 | 6.921 | 52.03 | 0.54127 | 5.6458 | 5.8392 | 6.3805 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE2
Sample No.: STAGE 2
Test No.: 11.1 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/28/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO  TEST PERFORMED  AS PER ASTM D 4767.

Specimen Height: 5.30 in
Specimen Area: 6.54 in^2
Specimen Volume: 34.65 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 5.8392 | 5.8392 | 0 | 0.000 | 0.79772 | 0.79772 | 1.000 | 0.79772 | 0 |
| 2 | 0.03 | 5.8825 | 5.8392 | 0.022824 | 0.527 | 0.81822 | 0.77489 | 1.056 | 0.79656 | 0.021662 |
| 3 | 0.06 | 5.9149 | 5.8392 | 0.041845 | 0.553 | 0.83153 | 0.75587 | 1.100 | 0.7937 | 0.037826 |
| 4 | 0.08 | 5.9437 | 5.8392 | 0.059235 | 0.567 | 0.84298 | 0.73848 | 1.142 | 0.79073 | 0.052249 |
| 5 | 0.11 | 5.9708 | 5.8392 | 0.06793 | 0.516 | 0.86138 | 0.72979 | 1.180 | 0.79559 | 0.065797 |
| 6 | 0.14 | 5.9961 | 5.8392 | 0.079885 | 0.509 | 0.87478 | 0.71783 | 1.219 | 0.79631 | 0.078473 |
| 7 | 0.17 | 6.0174 | 5.8392 | 0.098362 | 0.552 | 0.8776 | 0.69936 | 1.255 | 0.78848 | 0.089121 |
| 8 | 0.20 | 6.0364 | 5.8392 | 0.11412 | 0.579 | 0.88082 | 0.6836 | 1.289 | 0.78221 | 0.09861 |
| 9 | 0.23 | 6.0519 | 5.8392 | 0.12879 | 0.605 | 0.88165 | 0.66892 | 1.318 | 0.77529 | 0.10636 |
| 10 | 0.26 | 6.0663 | 5.8392 | 0.14292 | 0.629 | 0.88187 | 0.65479 | 1.347 | 0.76833 | 0.11354 |
| 11 | 0.29 | 6.0795 | 5.8392 | 0.15651 | 0.651 | 0.88147 | 0.64121 | 1.375 | 0.76134 | 0.12013 |
| 12 | 0.32 | 6.0926 | 5.8392 | 0.16901 | 0.667 | 0.88214 | 0.62871 | 1.403 | 0.75543 | 0.12672 |
| 13 | 0.35 | 6.1047 | 5.8392 | 0.18205 | 0.686 | 0.88112 | 0.61567 | 1.431 | 0.74839 | 0.13273 |
| 14 | 0.38 | 6.1167 | 5.8392 | 0.19346 | 0.697 | 0.88172 | 0.60425 | 1.459 | 0.74299 | 0.13873 |
| 15 | 0.40 | 6.1281 | 5.8392 | 0.20488 | 0.709 | 0.88174 | 0.59284 | 1.487 | 0.73729 | 0.14445 |
| 16 | 0.43 | 6.1412 | 5.8392 | 0.21629 | 0.716 | 0.88348 | 0.58143 | 1.519 | 0.73245 | 0.15102 |
| 17 | 0.51 | 6.1669 | 5.8392 | 0.24183 | 0.738 | 0.88358 | 0.55589 | 1.589 | 0.71973 | 0.16385 |
| 18 | 0.59 | 5.8668 | 5.8392 | 0.055974 | 2.030 | 0.76932 | 0.74174 | 1.037 | 0.75553 | 0.013785 |
| 19 | 0.66 | 5.9649 | 5.8392 | 0.1364 | 1.085 | 0.78702 | 0.66132 | 1.190 | 0.72417 | 0.062852 |
| 20 | 0.73 | 6.0325 | 5.8392 | 0.18151 | 0.939 | 0.80952 | 0.61621 | 1.314 | 0.71286 | 0.096654 |
| 21 | 0.80 | 6.092 | 5.8392 | 0.21466 | 0.849 | 0.83585 | 0.58306 | 1.434 | 0.70945 | 0.12639 |
| 22 | 0.87 | 6.1451 | 5.8392 | 0.244 | 0.798 | 0.85959 | 0.55372 | 1.552 | 0.70665 | 0.15294 |
| 23 | 0.94 | 6.1866 | 5.8392 | 0.27063 | 0.779 | 0.87452 | 0.52709 | 1.659 | 0.7008 | 0.17372 |
| 24 | 1.02 | 5.9702 | 5.8392 | 0.14999 | 1.145 | 0.77871 | 0.64773 | 1.202 | 0.71322 | 0.065489 |
| 25 | 1.08 | 6.061 | 5.8392 | 0.20488 | 0.924 | 0.81461 | 0.59284 | 1.374 | 0.70373 | 0.11088 |
| 26 | 1.15 | 6.1271 | 5.8392 | 0.22987 | 0.799 | 0.85571 | 0.56784 | 1.507 | 0.71178 | 0.14393 |
| 27 | 1.22 | 6.1805 | 5.8392 | 0.26574 | 0.779 | 0.8733 | 0.53198 | 1.642 | 0.70264 | 0.17066 |
| 28 | 1.29 | 6.2191 | 5.8392 | 0.29291 | 0.771 | 0.88466 | 0.50481 | 1.752 | 0.69474 | 0.18993 |
| [illegible] | 1.36 | 6.245 | 5.8392 | 0.31574 | 0.778 | 0.88779 | 0.48198 | 1.842 | 0.68488 | 0.2029 |
| [illegible] | 1.43 | 6.2618 | 5.8392 | 0.33476 | 0.792 | 0.88557 | 0.46296 | 1.913 | 0.67426 | 0.2113 |
| 31 | 1.50 | 6.278 | 5.8392 | 0.3516 | 0.801 | 0.88493 | 0.44611 | 1.984 | 0.66552 | 0.21941 |
| 32 | 1.57 | 6.2919 | 5.8392 | 0.36084 | 0.797 | 0.88958 | 0.43688 | 2.036 | 0.66323 | 0.22635 |
| 33 | 1.65 | 6.3064 | 5.8392 | 0.37552 | 0.804 | 0.88935 | 0.4222 | 2.106 | 0.65578 | 0.23358 |
| 34 | 1.72 | 6.3196 | 5.8392 | 0.39128 | 0.814 | 0.88689 | 0.40644 | 2.182 | 0.64666 | 0.24022 |
| 35 | 1.79 | 6.3284 | 5.8392 | 0.40541 | 0.829 | 0.88147 | 0.39231 | 2.247 | 0.63689 | 0.24458 |
| 36 | 1.87 | 6.3337 | 5.8392 | 0.41845 | 0.846 | 0.87373 | 0.37927 | 2.304 | 0.6265 | 0.24723 |
| 37 | 1.94 | 6.3418 | 5.8392 | 0.43095 | 0.857 | 0.86937 | 0.36677 | 2.370 | 0.61807 | 0.2513 |
| 38 | 2.01 | 6.3488 | 5.8392 | 0.44182 | 0.867 | 0.8655 | 0.3559 | 2.432 | 0.6107 | 0.2548 |
| 39 | 2.08 | 6.3529 | 5.8392 | 0.44345 | 0.863 | 0.86802 | 0.35427 | 2.450 | 0.61115 | 0.25687 |
| 40 | 2.15 | 6.3565 | 5.8392 | 0.45486 | 0.879 | 0.86018 | 0.34286 | 2.509 | 0.60152 | 0.25866 |
| 41 | 2.23 | 6.3646 | 5.8392 | 0.46573 | 0.886 | 0.85739 | 0.33199 | 2.583 | 0.59469 | 0.2627 |
| 42 | 2.30 | 6.367 | 5.8392 | 0.47497 | 0.900 | 0.85058 | 0.32275 | 2.635 | 0.58666 | 0.26391 |
| 43 | 2.38 | 6.374 | 5.8392 | 0.4842 | 0.905 | 0.84827 | 0.31352 | 2.706 | 0.58089 | 0.26738 |
| 44 | 2.45 | 6.3775 | 5.8392 | 0.49181 | 0.914 | 0.8442 | 0.30591 | 2.760 | 0.57505 | 0.26915 |
| 45 | 2.53 | 6.3838 | 5.8392 | 0.49942 | 0.917 | 0.84293 | 0.2983 | 2.826 | 0.57062 | 0.27232 |
| 46 | 2.60 | 6.3941 | 5.8392 | 0.49725 | 0.896 | 0.85538 | 0.30047 | 2.847 | 0.57792 | 0.27745 |
| 47 | 2.68 | 6.3965 | 5.8392 | 0.50648 | 0.909 | 0.84852 | 0.29123 | 2.914 | 0.56988 | 0.27864 |
| 48 | 2.75 | 6.3961 | 5.8392 | 0.51409 | 0.923 | 0.84049 | 0.28363 | 2.963 | 0.56206 | 0.27843 |
| 49 | 2.83 | 6.3962 | 5.8392 | 0.52061 | 0.935 | 0.83411 | 0.2771 | 3.010 | 0.55561 | 0.2785 |
| 50 | 2.90 | 6.3975 | 5.8392 | 0.52659 | 0.943 | 0.82938 | 0.27113 | 3.059 | 0.55025 | 0.27913 |
| 51 | 2.98 | 6.3965 | 5.8392 | 0.53203 | 0.955 | 0.82296 | 0.26569 | 3.097 | 0.54433 | 0.27863 |
| 52 | 3.05 | 6.396 | 5.8392 | 0.53746 | 0.965 | 0.8171 | 0.26026 | 3.140 | 0.53868 | 0.27842 |
| 53 | 3.13 | 6.395 | 5.8392 | 0.5342 | 0.961 | 0.81936 | 0.26352 | 3.109 | 0.54144 | 0.27792 |
| 54 | 3.20 | 6.4114 | 5.8392 | 0.53909 | 0.942 | 0.83084 | 0.25863 | 3.212 | 0.54473 | 0.2861 |
| 55 | 3.27 | 6.4132 | 5.8392 | 0.54561 | 0.951 | 0.82612 | 0.25211 | 3.277 | 0.53911 | 0.28701 |
| 56 | 3.34 | 6.4128 | 5.8392 | 0.54996 | 0.959 | 0.82134 | 0.24776 | 3.315 | 0.53455 | 0.28679 |
| 57 | 3.42 | 6.4124 | 5.8392 | 0.55485 | 0.968 | 0.81602 | 0.24287 | 3.360 | 0.52945 | 0.28658 |
| 58 | 3.49 | 6.413 | 5.8392 | 0.5592 | 0.974 | 0.81237 | 0.23852 | 3.406 | 0.52544 | 0.28692 |
| 59 | 3.56 | 6.4109 | 5.8392 | 0.563 | 0.985 | 0.80645 | 0.23472 | 3.436 | 0.52058 | 0.28587 |
| 60 | 3.63 | 6.4116 | 5.8392 | 0.56626 | 0.989 | 0.80388 | 0.23146 | 3.473 | 0.51767 | 0.28621 |
| 61 | 3.71 | 6.4117 | 5.8392 | 0.56083 | 0.980 | 0.80943 | 0.23689 | 3.417 | 0.52316 | 0.28627 |
| 62 | 3.78 | 6.4119 | 5.8392 | 0.56735 | 0.991 | 0.80304 | 0.23037 | 3.486 | 0.5167 | 0.28633 |
| 63 | 3.85 | 6.4125 | 5.8392 | 0.57115 | 0.996 | 0.79991 | 0.22656 | 3.531 | 0.51324 | 0.28667 |
| 64 | 3.92 | 6.4121 | 5.8392 | 0.57441 | 1.003 | 0.79624 | 0.2233 | 3.566 | 0.50977 | 0.28647 |
| 65 | 3.99 | 6.4111 | 5.8392 | 0.57768 | 1.010 | 0.79198 | 0.22004 | 3.599 | 0.50601 | 0.28597 |
| 66 | 4.07 | 6.4107 | 5.8392 | 0.58039 | 1.016 | 0.78883 | 0.21733 | 3.630 | 0.50308 | 0.28575 |
| 67 | 4.14 | 6.4092 | 5.8392 | 0.58257 | 1.022 | 0.78511 | 0.21515 | 3.649 | 0.50013 | 0.28498 |
| 68 | 4.21 | 6.412 | 5.8392 | 0.57441 | 1.003 | 0.79615 | 0.2233 | 3.565 | 0.50973 | 0.28642 |
| 69 | 4.29 | 6.4083 | 5.8392 | 0.58148 | 1.022 | 0.78532 | 0.21624 | 3.632 | 0.50078 | 0.28454 |
| [illegible] | 4.36 | 6.4078 | 5.8392 | 0.5842 | 1.027 | 0.78215 | 0.21352 | 3.663 | 0.49784 | 0.28432 |
| [illegible] | 4.44 | 6.408 | 5.8392 | 0.58746 | 1.033 | 0.77901 | 0.21026 | 3.705 | 0.49464 | 0.28438 |
| 72 | 4.51 | 6.4075 | 5.8392 | 0.58963 | 1.037 | 0.77641 | 0.20809 | 3.731 | 0.49225 | 0.28416 |
| 73 | 4.59 | 6.4071 | 5.8392 | 0.5918 | 1.042 | 0.77378 | 0.20591 | 3.758 | 0.48985 | 0.28393 |
| 74 | 4.66 | 6.4044 | 5.8392 | 0.59344 | 1.050 | 0.76951 | 0.20428 | 3.767 | 0.4869 | 0.28261 |
| 75 | 4.73 | 6.4018 | 5.8392 | 0.58583 | 1.041 | 0.77449 | 0.21189 | 3.655 | 0.49319 | 0.2813 |
| 76 | 4.80 | 6.3975 | 5.8392 | 0.59126 | 1.059 | 0.76478 | 0.20646 | 3.704 | 0.48562 | 0.27916 |
| 77 | 4.88 | 6.3976 | 5.8392 | 0.59344 | 1.063 | 0.76271 | 0.20428 | 3.734 | 0.4835 | 0.27921 |
| 78 | 4.95 | 6.395 | 5.8392 | 0.59561 | 1.072 | 0.75792 | 0.20211 | 3.750 | 0.48001 | 0.2779 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 5.03 | 6.3935 | 5.8392 | 0.59724 | 1.078 | 0.75475 | 0.20048 | 3.765 | 0.47762 | 0.27714 |
| 80 | 5.10 | 6.393 | 5.8392 | 0.59941 | 1.082 | 0.75213 | 0.19831 | 3.793 | 0.47522 | 0.27691 |
| 81 | 5.18 | 6.3882 | 5.8392 | 0.59507 | 1.084 | 0.75165 | 0.20265 | 3.709 | 0.47715 | 0.2745 |
| 82 | 5.25 | 6.3889 | 5.8392 | 0.59452 | 1.082 | 0.75286 | 0.2032 | 3.705 | 0.47803 | 0.27483 |
| 83 | 5.33 | 6.389 | 5.8392 | 0.59833 | 1.088 | 0.74917 | 0.19939 | 3.757 | 0.47428 | 0.27489 |
| 84 | 5.40 | 6.3842 | 5.8392 | 0.6005 | 1.102 | 0.74218 | 0.19722 | 3.763 | 0.4697 | 0.27248 |
| 85 | 5.48 | 6.3826 | 5.8392 | 0.60213 | 1.108 | 0.73903 | 0.19559 | 3.778 | 0.46731 | 0.27172 |
| 86 | 5.55 | 6.3806 | 5.8392 | 0.60376 | 1.115 | 0.73533 | 0.19396 | 3.791 | 0.46464 | 0.27069 |
| [illegible]7 | 5.57 | 6.3805 | 5.8392 | 0.6043 | 1.116 | 0.73469 | 0.19342 | 3.798 | 0.46405 | 0.27064 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE3
Sample No.: ST-3
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/29/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
R[illegible]s: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Sp[illegible]men Height: 4.82 in
Specimen Area: 6.67 in^2
Specimen Volume: 32.13 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Time min | Vertical Strain % | Corrected Area in^2 | Deviator Load lb | Deviator Stress tsf | Pore Pressure tsf | Horizontal Stress tsf | Vertical Stress tsf |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 6.6663 | 0 | 0 | 5.0437 | 7.0416 | 7.0416 |
| 2 | 5 | 0.078052 | 6.6715 | 7.8149 | 0.08434 | 5.4844 | 7.0416 | 7.1259 |
| 3 | 10 | 0.15788 | 6.6769 | 13.847 | 0.14931 | 5.6056 | 7.0416 | 7.1909 |
| 4 | 15 | 0.23593 | 6.6821 | 18.882 | 0.20345 | 5.6882 | 7.0416 | 7.2451 |
| 5 | 20 | 0.31221 | 6.6872 | 23.287 | 0.25073 | 5.7539 | 7.0416 | 7.2923 |
| 6 | 25 | 0.39026 | 6.6924 | 27.378 | 0.29455 | 5.7974 | 7.0416 | 7.3361 |
| 7 | 30 | 0.46831 | 6.6977 | 31.102 | 0.33435 | 5.8512 | 7.0416 | 7.3759 |
| 8 | 35.001 | 0.54636 | 6.7029 | 34.616 | 0.37183 | 5.9023 | 7.0416 | 7.4134 |
| 9 | 40.001 | 0.62619 | 6.7083 | 37.973 | 0.40756 | 5.9447 | 7.0416 | 7.4492 |
| 10 | 45.001 | 0.71489 | 6.7143 | 22.081 | 0.23678 | 5.8653 | 7.0416 | 7.2784 |
| 11 | 50.001 | 0.78939 | 6.7194 | 31.26 | 0.33496 | 5.9349 | 7.0416 | 7.3766 |
| 12 | 55.001 | 0.86744 | 6.7246 | 37.921 | 0.40601 | 5.9833 | 7.0416 | 7.4476 |
| 13 | 60.001 | 0.94372 | 6.7298 | 42.484 | 0.45452 | 6.0213 | 7.0416 | 7.4961 |
| 14 | 70.001 | 1.1016 | 6.7406 | 48.673 | 0.5199 | 6.0822 | 7.0416 | 7.5615 |
| 15 | 80.001 | 1.2577 | 6.7512 | 53.446 | 0.56998 | 6.1414 | 7.0416 | 7.6116 |
| 16 | 90.002 | 1.4245 | 6.7626 | 57.746 | 0.61481 | 6.1947 | 7.0416 | 7.6564 |
| 17 | 100 | 1.5788 | 6.7733 | 61.103 | 0.64953 | 6.224 | 7.0416 | 7.6911 |
| 18 | 110 | 1.7384 | 6.7843 | 64.198 | 0.68132 | 6.2794 | 7.0416 | 7.7229 |
| 19 | 120 | 1.8963 | 6.7952 | 66.768 | 0.70745 | 6.3191 | 7.0416 | 7.7491 |
| 20 | 130 | 2.056 | 6.8062 | 69.233 | 0.73238 | 6.3539 | 7.0416 | 7.774 |
| 21 | 140 | 2.2192 | 6.8176 | 71.593 | 0.75609 | 6.3778 | 7.0416 | 7.7977 |
| 22 | 150 | 2.3806 | 6.8289 | 73.324 | 0.77309 | 6.4099 | 7.0416 | 7.8147 |
| 23 | 160 | 2.5456 | 6.8404 | 75.369 | 0.79331 | 6.4365 | 7.0416 | 7.8349 |
| 24 | 170 | 2.707 | 6.8518 | 76.995 | 0.80908 | 6.4419 | 7.0416 | 7.8507 |
| 25 | 180 | 2.8684 | 6.8632 | 78.254 | 0.82094 | 6.4772 | 7.0416 | 7.8625 |
| 26 | 190 | 3.0298 | 6.8746 | 79.46 | 0.83221 | 6.4979 | 7.0416 | 7.8738 |
| 27 | 200 | 3.1913 | 6.8861 | 80.3 | 0.8396 | 6.499 | 7.0416 | 7.8812 |
| 28 | 210 | 3.3545 | 6.8977 | 81.401 | 0.84969 | 6.5267 | 7.0416 | 7.8913 |
| 29 | 220 | 3.5123 | 6.909 | 82.135 | 0.85595 | 6.5446 | 7.0416 | 7.8975 |
| [illegible] | 230 | 3.6738 | 6.9206 | 82.922 | 0.8627 | 6.5588 | 7.0416 | 7.9043 |
| [illegible] | 240 | 3.8352 | 6.9322 | 83.919 | 0.87161 | 6.5588 | 7.0416 | 7.9132 |
| 32 | 270 | 4.3248 | 6.9677 | 84.81 | 0.87638 | 6.5838 | 7.0416 | 7.918 |
| 33 | 300 | 4.8073 | 7.003 | 85.44 | 0.87843 | 6.612 | 7.0416 | 7.92 |
| 34 | 330 | 5.2934 | 7.0389 | 86.017 | 0.87985 | 6.6283 | 7.0416 | 7.9215 |
| 35 | 360 | 5.7759 | 7.075 | 84.968 | 0.86469 | 6.6408 | 7.0416 | 7.9063 |
| 36 | 390 | 6.2548 | 7.1111 | 84.443 | 0.85499 | 6.6479 | 7.0416 | 7.8966 |
| 37 | 420 | 6.7391 | 7.148 | 82.765 | 0.83366 | 6.6631 | 7.0416 | 7.8753 |
| 38 | 450 | 7.2234 | 7.1853 | 81.978 | 0.82145 | 6.6691 | 7.0416 | 7.8631 |
| 39 | 480 | 7.713 | 7.2235 | 81.978 | 0.81712 | 6.674 | 7.0416 | 7.8587 |
| 40 | 510 | 8.199 | 7.2617 | 81.349 | 0.80657 | 6.6772 | 7.0416 | 7.8482 |
| 41 | 540 | 8.6833 | 7.3002 | 81.139 | 0.80025 | 6.6816 | 7.0416 | 7.8418 |
| 42 | 570 | 9.1623 | 7.3387 | 79.88 | 0.7837 | 6.6854 | 7.0416 | 7.8253 |
| 43 | 600 | 9.6448 | 7.3779 | 80.09 | 0.78159 | 6.6881 | 7.0416 | 7.8232 |
| 44 | 630 | 10.133 | 7.4179 | 80.142 | 0.77788 | 6.6908 | 7.0416 | 7.8195 |
| 45 | 660 | 10.615 | 7.458 | 81.821 | 0.7899 | 6.693 | 7.0416 | 7.8315 |
| 46 | 690 | 11.105 | 7.4991 | 80.981 | 0.77752 | 6.6941 | 7.0416 | 7.8191 |
| 47 | 720 | 11.585 | 7.5398 | 81.873 | 0.78183 | 6.6957 | 7.0416 | 7.8234 |
| 48 | 750 | 12.066 | 7.5811 | 81.558 | 0.77459 | 6.6957 | 7.0416 | 7.8162 |
| 49 | 780 | 12.549 | 7.6229 | 81.558 | 0.77034 | 6.6963 | 7.0416 | 7.8119 |
| 50 | 810 | 13.038 | 7.6658 | 79.408 | 0.74583 | 6.6941 | 7.0416 | 7.7874 |
| 51 | 840 | 13.523 | 7.7087 | 79.355 | 0.74118 | 6.6946 | 7.0416 | 7.7828 |
| 52 | 870 | 14.009 | 7.7523 | 79.67 | 0.73994 | 6.6946 | 7.0416 | 7.7815 |
| 53 | 899.04 | 14.47 | 7.7941 | 80.09 | 0.73985 | 6.6946 | 7.0416 | 7.7814 |

# TRIAXIAL TEST

Project: RICO ARGENTINE SITE OU01
Boring No.: ST-3 STAGE3
Sample No.: ST-3
Test No.: 27.8 PSI

Location: RICO, CO
Tested By: BCM
Test Date: 11/29/11
Sample Type: 3" ST

Project No.: 60157757
Checked By: WPQ
Depth: 2.0'-4.0'
Elevation: ----

AECOM

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN STAGED TRIAXIAL TEST
Re[illegible]ks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Sp[illegible]men Height: 4.82 in
Specimen Area: 6.67 in^2
Specimen Volume: 32.13 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 74

Plastic Limit: 57

Estimated Specific Gravity: 2.99

| | Vertical Strain % | Total Vertical Stress tsf | Total Horizontal Stress tsf | Excess Pore Pressure tsf | A Parameter | Effective Vertical Stress tsf | Effective Horizontal Stress tsf | Stress Ratio | Effective p tsf | q tsf |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 7.0416 | 7.0416 | 0 | 0.000 | 1.9979 | 1.9979 | 1.000 | 1.9979 | 0 |
| 2 | 0.08 | 7.1259 | 7.0416 | 0.44073 | 5.226 | 1.6416 | 1.5572 | 1.054 | 1.5994 | 0.04217 |
| 3 | 0.16 | 7.1909 | 7.0416 | 0.56192 | 3.763 | 1.5853 | 1.436 | 1.104 | 1.5107 | 0.074657 |
| 4 | 0.24 | 7.2451 | 7.0416 | 0.64452 | 3.168 | 1.5569 | 1.3534 | 1.150 | 1.4552 | 0.10173 |
| 5 | 0.31 | 7.2923 | 7.0416 | 0.71027 | 2.833 | 1.5384 | 1.2877 | 1.195 | 1.413 | 0.12537 |
| 6 | 0.39 | 7.3361 | 7.0416 | 0.75375 | 2.559 | 1.5387 | 1.2442 | 1.237 | 1.3915 | 0.14727 |
| 7 | 0.47 | 7.3759 | 7.0416 | 0.80755 | 2.415 | 1.5247 | 1.1904 | 1.281 | 1.3576 | 0.16717 |
| 8 | 0.55 | 7.4134 | 7.0416 | 0.85863 | 2.309 | 1.5111 | 1.1393 | 1.326 | 1.3252 | 0.18592 |
| 9 | 0.63 | 7.4492 | 7.0416 | 0.90102 | 2.211 | 1.5045 | 1.0969 | 1.372 | 1.3007 | 0.20378 |
| 10 | 0.71 | 7.2784 | 7.0416 | 0.82168 | 3.470 | 1.413 | 1.1763 | 1.201 | 1.2947 | 0.11839 |
| 11 | 0.79 | 7.3766 | 7.0416 | 0.89124 | 2.661 | 1.4417 | 1.1067 | 1.303 | 1.2742 | 0.16748 |
| 12 | 0.87 | 7.4476 | 7.0416 | 0.93961 | 2.314 | 1.4644 | 1.0583 | 1.384 | 1.2613 | 0.20301 |
| 13 | 0.94 | 7.4961 | 7.0416 | 0.97765 | 2.151 | 1.4748 | 1.0203 | 1.445 | 1.2476 | 0.22726 |
| 14 | 1.10 | 7.5615 | 7.0416 | 1.0385 | 1.998 | 1.4793 | 0.95943 | 1.542 | 1.2194 | 0.25995 |
| 15 | 1.26 | 7.6116 | 7.0416 | 1.0977 | 1.926 | 1.4702 | 0.9002 | 1.633 | 1.1852 | 0.28499 |
| 16 | 1.42 | 7.6564 | 7.0416 | 1.151 | 1.872 | 1.4618 | 0.84694 | 1.726 | 1.1543 | 0.30741 |
| 17 | 1.58 | 7.6911 | 7.0416 | 1.1803 | 1.817 | 1.4671 | 0.8176 | 1.794 | 1.1424 | 0.32477 |
| 18 | 1.74 | 7.7229 | 7.0416 | 1.2358 | 1.814 | 1.4435 | 0.76217 | 1.894 | 1.1028 | 0.34066 |
| 19 | 1.90 | 7.7491 | 7.0416 | 1.2755 | 1.803 | 1.4299 | 0.72249 | 1.979 | 1.0762 | 0.35373 |
| 20 | 2.06 | 7.774 | 7.0416 | 1.3102 | 1.789 | 1.4201 | 0.68771 | 2.065 | 1.0539 | 0.36619 |
| 21 | 2.22 | 7.7977 | 7.0416 | 1.3341 | 1.765 | 1.4199 | 0.6638 | 2.139 | 1.0418 | 0.37804 |
| 22 | 2.38 | 7.8147 | 7.0416 | 1.3662 | 1.767 | 1.4048 | 0.63174 | 2.224 | 1.0183 | 0.38654 |
| 23 | 2.55 | 7.8349 | 7.0416 | 1.3928 | 1.756 | 1.3984 | 0.60511 | 2.311 | 1.0018 | 0.39666 |
| 24 | 2.71 | 7.8507 | 7.0416 | 1.3983 | 1.728 | 1.4088 | 0.59968 | 2.349 | 1.0042 | 0.40454 |
| 25 | 2.87 | 7.8625 | 7.0416 | 1.4336 | 1.746 | 1.3853 | 0.56435 | 2.455 | 0.97483 | 0.41047 |
| 26 | 3.03 | 7.8738 | 7.0416 | 1.4542 | 1.747 | 1.3759 | 0.5437 | 2.531 | 0.95981 | 0.41611 |
| 27 | 3.19 | 7.8812 | 7.0416 | 1.4553 | 1.733 | 1.3822 | 0.54262 | 2.547 | 0.96242 | 0.4198 |
| 28 | 3.35 | 7.8913 | 7.0416 | 1.483 | 1.745 | 1.3646 | 0.5149 | 2.650 | 0.93974 | 0.42484 |
| [illegible] | 3.51 | 7.8975 | 7.0416 | 1.501 | 1.754 | 1.3529 | 0.49697 | 2.722 | 0.92494 | 0.42797 |
| [illegible] | 3.67 | 7.9043 | 7.0416 | 1.5151 | 1.756 | 1.3455 | 0.48284 | 2.787 | 0.91419 | 0.43135 |
| 31 | 3.84 | 7.9132 | 7.0416 | 1.5151 | 1.738 | 1.3544 | 0.48284 | 2.805 | 0.91864 | 0.4358 |
| 32 | 4.32 | 7.918 | 7.0416 | 1.5401 | 1.757 | 1.3342 | 0.45784 | 2.914 | 0.89603 | 0.43819 |
| 33 | 4.81 | 7.92 | 7.0416 | 1.5684 | 1.785 | 1.308 | 0.42958 | 3.045 | 0.8688 | 0.43922 |
| 34 | 5.29 | 7.9215 | 7.0416 | 1.5847 | 1.801 | 1.2931 | 0.41328 | 3.129 | 0.8532 | 0.43993 |
| 35 | 5.78 | 7.9063 | 7.0416 | 1.5972 | 1.847 | 1.2655 | 0.40078 | 3.158 | 0.83313 | 0.43235 |
| 36 | 6.25 | 7.8966 | 7.0416 | 1.6042 | 1.876 | 1.2487 | 0.39371 | 3.172 | 0.82121 | 0.42749 |
| 37 | 6.74 | 7.8753 | 7.0416 | 1.6194 | 1.943 | 1.2122 | 0.3785 | 3.203 | 0.79533 | 0.41683 |
| 38 | 7.22 | 7.8631 | 7.0416 | 1.6254 | 1.979 | 1.194 | 0.37252 | 3.205 | 0.78325 | 0.41073 |
| 39 | 7.71 | 7.8587 | 7.0416 | 1.6303 | 1.995 | 1.1847 | 0.36763 | 3.223 | 0.77619 | 0.40856 |
| 40 | 8.20 | 7.8482 | 7.0416 | 1.6336 | 2.025 | 1.1709 | 0.36437 | 3.214 | 0.76766 | 0.40329 |
| 41 | 8.68 | 7.8418 | 7.0416 | 1.6379 | 2.047 | 1.1603 | 0.36002 | 3.223 | 0.76015 | 0.40012 |
| 42 | 9.16 | 7.8253 | 7.0416 | 1.6417 | 2.095 | 1.1399 | 0.35622 | 3.200 | 0.74807 | 0.39185 |
| 43 | 9.64 | 7.8232 | 7.0416 | 1.6444 | 2.104 | 1.1351 | 0.3535 | 3.211 | 0.74429 | 0.39079 |
| 44 | 10.13 | 7.8195 | 7.0416 | 1.6472 | 2.118 | 1.1287 | 0.35078 | 3.218 | 0.73972 | 0.38894 |
| 45 | 10.62 | 7.8315 | 7.0416 | 1.6493 | 2.088 | 1.1385 | 0.34861 | 3.266 | 0.74356 | 0.39495 |
| 46 | 11.10 | 7.8191 | 7.0416 | 1.6504 | 2.123 | 1.125 | 0.34752 | 3.237 | 0.73628 | 0.38876 |
| 47 | 11.59 | 7.8234 | 7.0416 | 1.6521 | 2.113 | 1.1277 | 0.34589 | 3.260 | 0.73681 | 0.39091 |
| 48 | 12.07 | 7.8162 | 7.0416 | 1.6521 | 2.133 | 1.1205 | 0.34589 | 3.239 | 0.73319 | 0.38729 |
| 49 | 12.55 | 7.8119 | 7.0416 | 1.6526 | 2.145 | 1.1157 | 0.34535 | 3.231 | 0.73052 | 0.38517 |
| 50 | 13.04 | 7.7874 | 7.0416 | 1.6504 | 2.213 | 1.0934 | 0.34752 | 3.146 | 0.72044 | 0.37291 |
| 51 | 13.52 | 7.7828 | 7.0416 | 1.651 | 2.227 | 1.0882 | 0.34698 | 3.136 | 0.71757 | 0.37059 |
| 52 | 14.01 | 7.7815 | 7.0416 | 1.651 | 2.231 | 1.0869 | 0.34698 | 3.133 | 0.71695 | 0.36997 |
| 53 | 14.47 | 7.7814 | 7.0416 | 1.651 | 2.231 | 1.0868 | 0.34698 | 3.132 | 0.7169 | 0.36992 |

**Laboratory Services Group** 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 279-2500 Fax:(847) 279-2550

AECOM PROJECT NO.: **60157757** **12/1/2011**
PROJECT NAME: **RICO ARGENTINE SITE OU01**
LOCATION: **RICO, CO**

NOTE: **SAMPLE UTILIZED AS A STAGED TRIAXIAL TEST IMMEDIATELY AFTER PERMESBILITY TESTING. FINAL SPECIMEN INFORMATION NOT REPORTED**

## SUMMARY OF TEST RESULTS

BORING NO. ST-2

SAMPLE NO.

DEPTH: 2.0'-4.0'

CLASSIFICATION LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN

| | INITIAL |
|---|---|
| DRY UNIT WEIGHT (pcf) | 21.9 |
| WATER CONTENT (%) | 244.3 |
| DIAMETER (cm) | 7.185 |
| LENGTH (cm) | 15.016 |

| | | |
|---|---|---|
| HYDRAULIC GRADIENT (MAXIMUM) | 6.28 | |
| PERCENT SATURATION | 100.0 | (Percent saturation calculation is based on final measurements and a estimated specific gravity.) |
| HYDRAULIC CONDUCTIVITY k (cm/sec) | 2.17E-06 | |

Deaired water was used as the liquid permeant.

AECOM

## HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

**Laboratory Services Group** 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 279-2500 Fax:(847) 279-2550

| | | |
|---|---|---|
| AECOM PROJECT NO.: | **60157757** | **12/1/2011** |
| PROJECT NAME: | **RICO ARGENTINE SITE OU01** | |
| LOCATION: | **RICO, CO** | |

NOTE: **SAMPLE UTILIZED AS A STAGED TRIAXIAL TEST IMMEDIATELY AFTER PERMESBILITY TESTING. FINAL SPECIMEN INFORMATION NOT REPORTED**

### SUMMARY OF TEST RESULTS

| | |
|---|---|
| BORING NO. | ST-2 |
| SAMPLE NO. | |
| DEPTH: | 2.0'-4.0' |
| CLASSIFICATION | LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN |

| | INITIAL |
|---|---|
| DRY UNIT WEIGHT (pcf) | 21.9 |
| WATER CONTENT (%) | 244.3 |
| DIAMETER (cm) | 7.185 |
| LENGTH (cm) | 15.016 |

| | | |
|---|---|---|
| HYDRAULIC GRADIENT (MAXIMUM) | 6.28 | |
| PERCENT SATURATION | 100.0 | (Percent saturation calculation is based on final measurements and a estimated specific gravity.) |
| HYDRAULIC CONDUCTIVITY k (cm/sec) | 2.17E-06 | |

Deaired water was used as the liquid permeant.

| | | |
|---|---|---|
| AECOM PROJECT NO.: | **60157757** | **12/1/2011** |
| PROJECT NAME: | **RICO ARGENTINE SITE OU01** | |
| LOCATION: | **RICO, CO** | |
| NOTE: | **SAMPLE UTILIZED AS A STAGED TRIAXIAL TEST IMMEDIATELY AFTER PERMESBILITY TESTING. FINAL SPECIMEN INFORMATION NOT REPORTED** | |

## SUMMARY OF TEST RESULTS

| | |
|---|---|
| BORING NO. | ST-3 |
| SAMPLE NO. | |
| DEPTH: | 2.0'-4.0' |
| CLASSIFICATION | LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN |

| | INITIAL |
|---|---|
| DRY UNIT WEIGHT (pcf) | 25.1 |
| WATER CONTENT (%) | 213.6 |
| DIAMETER (cm) | 7.191 |
| LENGTH (cm) | 15.216 |

| | |
|---|---|
| HYDRAULIC GRADIENT (MAXIMUM) | 6.20 |
| PERCENT SATURATION | 100.0 |
| HYDRAULIC CONDUCTIVITY k (cm/sec) | 2.20E-06 |

Deaired water was used as the liquid permeant.

AECOM

## HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

**Laboratory Services Group** 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 279-2500 Fax:(847) 279-2550

| | | |
|---|---|---|
| AECOM PROJECT NO.: | **60157757** | **12/1/2011** |
| PROJECT NAME: | **RICO ARGENTINE SITE OU01** | |
| LOCATION: | **RICO, CO** | |
| NOTE: | **SAMPLE UTILIZED AS A STAGED TRIAXIAL TEST IMMEDIATELY AFTER PERMESBILITY TESTING. FINAL SPECIMEN INFORMATION NOT REPORTED** | |

## SUMMARY OF TEST RESULTS

| | |
|---|---|
| BORING NO. | ST-3 |
| SAMPLE NO. | |
| DEPTH: | 2.0'-4.0' |
| CLASSIFICATION | LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN |

| | INITIAL |
|---|---|
| DRY UNIT WEIGHT (pcf) | 25.1 |
| WATER CONTENT (%) | 213.6 |
| DIAMETER (cm) | 7.191 |
| LENGTH (cm) | 15.216 |

| | |
|---|---|
| HYDRAULIC GRADIENT (MAXIMUM) | 6.20 |
| PERCENT SATURATION | 100.0 |
| HYDRAULIC CONDUCTIVITY k (cm/sec) | 2.20E-06 |

Deaired water was used as the liquid permeant.

DIRECT SHEAR TEST DATA

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 1 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 4998 | 6.434 | 0 | 0 | 0 |
| 2 | 0.10 | 5000 | 6.434 | -1.568 | -0.001219 | 0.001219 |
| 3 | 0.25 | 4998 | 6.435 | 67.42 | 0.009749 | 0.009749 |
| 4 | 0.45 | 4998 | 6.437 | 199.1 | 0.0329 | 0.0329 |

# DIRECT SHEAR TEST DATA

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 2 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 4998 | 6.437 | 200.7 | 0.03412 | 0.0329 |
| 2 | 0.10 | 5000 | 6.437 | 192.9 | 0.03656 | 0.03534 |
| 3 | 0.25 | 5000 | 6.437 | 191.3 | 0.039 | 0.03778 |
| 4 | 0.50 | 5000 | 6.437 | 192.9 | 0.04021 | 0.039 |
| 5 | 1.00 | 5000 | 6.437 | 194.4 | 0.04387 | 0.04265 |
| 6 | 2.00 | 5000 | 6.438 | 196 | 0.04631 | 0.04509 |
| 7 | 4.00 | 5000 | 6.438 | 199.1 | 0.04996 | 0.04874 |
| 8 | 9.00 | 5000 | 6.437 | 199.1 | 0.05606 | 0.05484 |
| 9 | 16.00 | 5000 | 6.439 | 199.1 | 0.05971 | 0.05849 |
| 10 | 25.00 | 5000 | 6.44 | 199.1 | 0.06215 | 0.06093 |
| 11 | 36.00 | 5000 | 6.441 | 199.1 | 0.06337 | 0.06215 |
| 12 | 49.00 | 5000 | 6.442 | 199.1 | 0.06459 | 0.06337 |
| 13 | 64.00 | 5000 | 6.443 | 199.1 | 0.06824 | 0.06702 |
| 14 | 120.00 | 5000 | 6.446 | 199.1 | 0.0719 | 0.07068 |
| 15 | 180.00 | 5000 | 6.446 | 199.1 | 0.0719 | 0.07068 |
| 16 | 240.00 | 5000 | 6.452 | 199.1 | 0.07312 | 0.0719 |
| 17 | 300.00 | 5000 | 6.461 | 200.7 | 0.07555 | 0.07433 |
| 18 | 360.00 | 5000 | 6.468 | 199.1 | 0.07677 | 0.07555 |
| 19 | 420.00 | 5000 | 6.473 | 199.1 | 0.07921 | 0.07799 |
| 20 | 480.00 | 5000 | 6.473 | 199.1 | 0.08043 | 0.07921 |
| 21 | 540.00 | 5000 | 6.476 | 200.7 | 0.08408 | 0.08286 |
| 22 | 600.00 | 5000 | 6.482 | 199.1 | 0.09139 | 0.09018 |
| 23 | 660.00 | 5000 | 6.482 | 199.1 | 0.09139 | 0.09018 |
| 24 | 720.00 | 5000 | 6.482 | 199.1 | 0.09261 | 0.09139 |
| 25 | 780.00 | 5000 | 6.485 | 199.1 | 0.09261 | 0.09139 |
| 26 | 840.00 | 5000 | 6.484 | 199.1 | 0.09383 | 0.09261 |
| 27 | 900.00 | 5000 | 6.483 | 199.1 | 0.09383 | 0.09261 |
| 28 | 960.00 | 5000 | 6.487 | 199.1 | 0.09627 | 0.09505 |
| 29 | 1020.00 | 5000 | 6.488 | 199.1 | 0.09627 | 0.09505 |
| 30 | 1080.00 | 5000 | 6.49 | 199.1 | 0.09871 | 0.09749 |
| 31 | 1140.00 | 5000 | 6.49 | 199.1 | 0.09749 | 0.09627 |
| 32 | 1200.00 | 5000 | 6.491 | 199.1 | 0.09871 | 0.09749 |
| 33 | 1260.00 | 5000 | 6.492 | 199.1 | 0.09992 | 0.09871 |
| 34 | 1320.00 | 4998 | 6.495 | 199.1 | 0.1024 | 0.1011 |
| 35 | 1380.00 | 5000 | 6.496 | 199.1 | 0.1024 | 0.1011 |
| 36 | 1440.00 | 5001 | 6.498 | 199.1 | 0.1048 | 0.1036 |
| 37 | 1500.00 | 5000 | 6.497 | 199.1 | 0.1048 | 0.1036 |
| 38 | 1560.00 | 5000 | 6.499 | 199.1 | 0.1072 | 0.106 |
| 39 | 1620.00 | 5000 | 6.5 | 199.1 | 0.1085 | 0.1072 |
| 40 | 1680.00 | 5000 | 6.501 | 199.1 | 0.1109 | 0.1097 |
| 41 | 1740.00 | 5000 | 6.502 | 199.1 | 0.1133 | 0.1121 |
| 42 | 1800.00 | 5000 | 6.503 | 199.1 | 0.1133 | 0.1121 |
| 43 | 1860.00 | 5000 | 6.505 | 199.1 | 0.1145 | 0.1133 |
| 44 | 1920.00 | 5000 | 6.506 | 199.1 | 0.1158 | 0.1145 |
| 45 | 1980.00 | 5000 | 6.508 | 199.1 | 0.117 | 0.1158 |
| 46 | 2040.00 | 5000 | 6.509 | 199.1 | 0.117 | 0.1158 |
| 47 | 2100.00 | 5000 | 6.51 | 200.7 | 0.117 | 0.1158 |
| 48 | 2160.00 | 5000 | 6.512 | 199.1 | 0.1182 | 0.117 |
| 49 | 2220.00 | 5000 | 6.514 | 199.1 | 0.1206 | 0.1194 |
| 50 | 2280.00 | 5001 | 6.517 | 199.1 | 0.1231 | 0.1219 |
| 51 | 2340.00 | 5000 | 6.518 | 199.1 | 0.1255 | 0.1243 |
| 52 | 2400.00 | 5001 | 6.522 | 199.1 | 0.1267 | 0.1255 |
| 53 | 2460.00 | 5000 | 6.525 | 199.1 | 0.1316 | 0.1304 |
| 54 | 2520.00 | 5000 | 6.527 | 199.1 | 0.1328 | 0.1316 |
| 55 | 2580.00 | 5000 | 6.531 | 199.1 | 0.1377 | 0.1365 |
| 56 | 2640.00 | 5000 | 6.534 | 200.7 | 0.1401 | 0.1389 |
| 57 | 2700.00 | 5000 | 6.535 | 199.1 | 0.1426 | 0.1414 |
| 58 | 2760.00 | 5000 | 6.538 | 199.1 | 0.1462 | 0.145 |
| 59 | 2820.00 | 5000 | 6.54 | 199.1 | 0.1462 | 0.145 |
| 60 | 2880.00 | 5000 | 6.542 | 199.1 | 0.1511 | 0.1499 |
| 61 | 2940.00 | 5000 | 6.544 | 199.1 | 0.1535 | 0.1523 |
| 62 | 3000.00 | 5000 | 6.544 | 199.1 | 0.156 | 0.1548 |
| 63 | 3060.00 | 5000 | 6.547 | 199.1 | 0.1596 | 0.1584 |
| 64 | 3120.00 | 5000 | 6.549 | 200.7 | 0.1645 | 0.1633 |
| 65 | 3180.00 | 5000 | 6.55 | 199.1 | 0.1669 | 0.1657 |
| 66 | 3240.00 | 5000 | 6.553 | 199.1 | 0.1694 | 0.1682 |
| 67 | 3300.00 | 5000 | 6.551 | 199.1 | 0.1682 | 0.1669 |
| 68 | 3360.00 | 5000 | 6.553 | 199.1 | 0.1682 | 0.1669 |
| 69 | 3420.00 | 5000 | 6.554 | 199.1 | 0.1682 | 0.1669 |
| 70 | 3480.00 | 5000 | 6.555 | 199.1 | 0.1669 | 0.1657 |
| 71 | 3540.00 | 5000 | 6.554 | 199.1 | 0.1657 | 0.1645 |
| 72 | 3600.00 | 5000 | 6.553 | 199.1 | 0.1621 | 0.1609 |
| 73 | 3660.00 | 5000 | 6.552 | 199.1 | 0.1609 | 0.1596 |
| 74 | 3720.00 | 5000 | 6.552 | 199.1 | 0.1596 | 0.1584 |
| 75 | 3780.00 | 5000 | 6.551 | 199.1 | 0.1584 | 0.1572 |
| 76 | 3840.00 | 5000 | 6.552 | 199.1 | 0.156 | 0.1548 |
| 77 | 3900.00 | 5000 | 6.552 | 200.7 | 0.1548 | 0.1535 |
| 78 | 3960.00 | 5000 | 6.549 | 199.1 | 0.1499 | 0.1487 |
| 79 | 4020.00 | 5000 | 6.55 | 199.1 | 0.1499 | 0.1487 |
| 80 | 4080.00 | 5000 | 6.55 | 199.1 | 0.1475 | 0.1462 |
| 81 | 4140.00 | 5000 | 6.55 | 197.6 | 0.1462 | 0.145 |
| 82 | 4200.00 | 5000 | 6.548 | 199.1 | 0.1426 | 0.1414 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 83 | 4260.00 | 5001 | 6.546 | 199.1 | 0.1414 | 0.1401 |
| 84 | 4320.00 | 5000 | 6.546 | 200.7 | 0.1414 | 0.1401 |
| 85 | 4380.00 | 5000 | 6.547 | 197.6 | 0.1438 | 0.1426 |
| 86 | 4440.00 | 5000 | 6.548 | 199.1 | 0.145 | 0.1438 |
| 87 | 4474.70 | 5000 | 6.545 | 197.6 | 0.1426 | 0.1414 |

# DIRECT SHEAR TEST DATA

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 5000 PSF

Location: RICO, COLORADO
Tested By: BCM
Test Date: 11/7/11
Sample Type: TRIMMED

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: -----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 3 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5000 | 6.545 | 199.1 | 0.1426 | 0.1414 |
| 2 | 0.10 | 5000 | 6.545 | 243 | 0.145 | 0.1438 |
| 3 | 0.25 | 4998 | 6.545 | 443.7 | 0.1864 | 0.1852 |
| 4 | 0.29 | 5000 | 6.545 | 495.5 | 0.1925 | 0.1913 |

## DIRECT SHEAR TEST DATA

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 5000 PSF

Location: RICO, COLORADO
Tested By: BCM
Test Date: 11/7/11
Sample Type: TRIMMED

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: -----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 4 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5000 | 6.545 | 503.3 | 0.1938 | 0.1913 |
| 2 | 0.10 | 4998 | 6.545 | 490.8 | 0.195 | 0.1925 |
| 3 | 0.25 | 5000 | 6.545 | 489.2 | 0.1962 | 0.1938 |
| 4 | 0.50 | 5000 | 6.545 | 490.8 | 0.1962 | 0.1938 |
| 5 | 1.00 | 5000 | 6.545 | 492.3 | 0.1974 | 0.195 |
| 6 | 2.00 | 5000 | 6.544 | 493.9 | 0.1974 | 0.195 |
| 7 | 4.00 | 5000 | 6.546 | 493.9 | 0.2011 | 0.1986 |
| 8 | 9.00 | 5000 | 6.545 | 495.5 | 0.2023 | 0.1998 |
| 9 | 16.00 | 5000 | 6.544 | 495.5 | 0.2023 | 0.1998 |
| 10 | 25.00 | 5000 | 6.544 | 495.5 | 0.2023 | 0.1998 |
| 11 | 36.00 | 5000 | 6.544 | 495.5 | 0.2035 | 0.2011 |
| 12 | 49.00 | 5001 | 6.543 | 497 | 0.2035 | 0.2011 |
| 13 | 64.00 | 5000 | 6.544 | 495.5 | 0.2072 | 0.2047 |
| 14 | 120.00 | 5000 | 6.543 | 495.5 | 0.2084 | 0.2059 |
| 15 | 180.00 | 5000 | 6.542 | 495.5 | 0.2108 | 0.2084 |
| 16 | 240.00 | 5000 | 6.543 | 495.5 | 0.212 | 0.2096 |
| 17 | 300.00 | 5001 | 6.544 | 495.5 | 0.2157 | 0.2133 |
| 18 | 360.00 | 5000 | 6.545 | 493.9 | 0.2193 | 0.2169 |
| 19 | 420.00 | 5000 | 6.55 | 495.5 | 0.2267 | 0.2242 |
| 20 | 480.00 | 5000 | 6.552 | 495.5 | 0.2267 | 0.2242 |
| 21 | 540.00 | 5001 | 6.551 | 495.5 | 0.2279 | 0.2254 |
| 22 | 600.00 | 5000 | 6.553 | 495.5 | 0.2291 | 0.2267 |
| 23 | 660.00 | 5000 | 6.553 | 495.5 | 0.2303 | 0.2279 |
| 24 | 720.00 | 5000 | 6.553 | 495.5 | 0.2328 | 0.2303 |
| 25 | 780.00 | 5000 | 6.554 | 495.5 | 0.2328 | 0.2303 |
| 26 | 840.00 | 5000 | 6.555 | 495.5 | 0.2352 | 0.2328 |
| 27 | 900.00 | 5000 | 6.554 | 495.5 | 0.2315 | 0.2291 |
| 28 | 960.00 | 5000 | 6.555 | 495.5 | 0.2328 | 0.2303 |
| 29 | 1020.00 | 5000 | 6.556 | 497 | 0.2352 | 0.2328 |
| 30 | 1080.00 | 5000 | 6.556 | 497 | 0.2352 | 0.2328 |
| 31 | 1140.00 | 5000 | 6.555 | 495.5 | 0.2352 | 0.2328 |
| 32 | 1200.00 | 5000 | 6.555 | 495.5 | 0.2364 | 0.234 |
| 33 | 1260.00 | 5000 | 6.557 | 495.5 | 0.2376 | 0.2352 |
| 34 | 1320.00 | 5000 | 6.553 | 495.5 | 0.2364 | 0.234 |
| 35 | 1380.00 | 5000 | 6.551 | 495.5 | 0.2352 | 0.2328 |
| 36 | 1440.00 | 5000 | 6.549 | 495.5 | 0.2328 | 0.2303 |
| 37 | 1500.00 | 5000 | 6.546 | 495.5 | 0.2315 | 0.2291 |
| 38 | 1560.00 | 4998 | 6.544 | 495.5 | 0.2315 | 0.2291 |
| 39 | 1620.00 | 5000 | 6.545 | 495.5 | 0.2315 | 0.2291 |
| 40 | 1680.00 | 5000 | 6.545 | 495.5 | 0.234 | 0.2315 |
| 41 | 1740.00 | 5000 | 6.549 | 495.5 | 0.2364 | 0.234 |
| 42 | 1800.00 | 5000 | 6.549 | 497 | 0.234 | 0.2315 |
| 43 | 1860.00 | 5001 | 6.553 | 495.5 | 0.2376 | 0.2352 |
| 44 | 1920.00 | 5001 | 6.554 | 495.5 | 0.2376 | 0.2352 |
| 45 | 1980.00 | 5000 | 6.556 | 495.5 | 0.2376 | 0.2352 |
| 46 | 2040.00 | 5000 | 6.555 | 495.5 | 0.2364 | 0.234 |
| 47 | 2100.00 | 5000 | 6.555 | 495.5 | 0.234 | 0.2315 |
| 48 | 2160.00 | 4998 | 6.556 | 495.5 | 0.2352 | 0.2328 |
| 49 | 2220.00 | 5000 | 6.555 | 495.5 | 0.234 | 0.2315 |
| 50 | 2280.00 | 5000 | 6.557 | 495.5 | 0.2352 | 0.2328 |
| 51 | 2340.00 | 5000 | 6.555 | 495.5 | 0.2328 | 0.2303 |
| 52 | 2400.00 | 5000 | 6.556 | 495.5 | 0.234 | 0.2315 |
| 53 | 2460.00 | 5000 | 6.557 | 495.5 | 0.2328 | 0.2303 |
| 54 | 2520.00 | 5000 | 6.555 | 495.5 | 0.2291 | 0.2267 |
| 55 | 2580.00 | 5000 | 6.553 | 495.5 | 0.2279 | 0.2254 |
| 56 | 2608.36 | 5001 | 6.554 | 495.5 | 0.2291 | 0.2267 |

# DIRECT SHEAR TEST DATA

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 5 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5001 | 6.555 | 495.5 | 0.2291 | 0.2267 |
| 2 | 0.10 | 5006 | 6.555 | 577 | 0.2388 | 0.2364 |
| 3 | 0.21 | 5001 | 6.557 | 801.2 | 0.2827 | 0.2803 |

# DIRECT SHEAR TEST DATA

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 6 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5003 | 6.557 | 813.8 | 0.2864 | 0.2803 |
| 2 | 0.10 | 4978 | 6.557 | 784 | 0.2912 | 0.2852 |
| 3 | 0.25 | 5000 | 6.558 | 784 | 0.2961 | 0.29 |
| 4 | 0.50 | 5000 | 6.558 | 788.7 | 0.2998 | 0.2937 |
| 5 | 1.00 | 5000 | 6.558 | 793.4 | 0.3095 | 0.3034 |
| 6 | 2.00 | 5000 | 6.558 | 796.5 | 0.3132 | 0.3071 |
| 7 | 4.00 | 5000 | 6.557 | 798.1 | 0.3156 | 0.3095 |
| 8 | 9.00 | 5000 | 6.557 | 799.7 | 0.3205 | 0.3144 |
| 9 | 16.00 | 5001 | 6.557 | 801.2 | 0.3278 | 0.3217 |
| 10 | 25.00 | 5000 | 6.558 | 801.2 | 0.3315 | 0.3254 |
| 11 | 36.00 | 5000 | 6.557 | 801.2 | 0.3339 | 0.3278 |
| 12 | 49.00 | 5000 | 6.556 | 801.2 | 0.3327 | 0.3266 |
| 13 | 64.00 | 5000 | 6.556 | 801.2 | 0.3351 | 0.329 |
| 14 | 120.00 | 5000 | 6.554 | 801.2 | 0.3376 | 0.3315 |
| 15 | 180.00 | 5000 | 6.554 | 801.2 | 0.3388 | 0.3327 |
| 16 | 240.00 | 5000 | 6.552 | 801.2 | 0.3363 | 0.3302 |
| 17 | 300.00 | 5000 | 6.549 | 801.2 | 0.3327 | 0.3266 |
| 18 | 360.00 | 5000 | 6.551 | 801.2 | 0.3388 | 0.3327 |
| 19 | 420.00 | 5000 | 6.549 | 801.2 | 0.3363 | 0.3302 |
| 20 | 480.00 | 5000 | 6.549 | 801.2 | 0.3376 | 0.3315 |
| 21 | 540.00 | 5000 | 6.549 | 799.7 | 0.3376 | 0.3315 |
| 22 | 600.00 | 5000 | 6.547 | 801.2 | 0.3363 | 0.3302 |
| 23 | 660.00 | 5000 | 6.546 | 799.7 | 0.3363 | 0.3302 |
| 24 | 720.00 | 5001 | 6.553 | 801.2 | 0.34 | 0.3339 |
| 25 | 780.00 | 4998 | 6.55 | 801.2 | 0.3376 | 0.3315 |
| 26 | 840.00 | 5000 | 6.551 | 801.2 | 0.3376 | 0.3315 |
| 27 | 900.00 | 5000 | 6.55 | 801.2 | 0.3351 | 0.329 |
| 28 | 960.00 | 5000 | 6.55 | 801.2 | 0.3351 | 0.329 |
| 29 | 1020.00 | 5000 | 6.549 | 801.2 | 0.3327 | 0.3266 |
| 30 | 1080.00 | 5000 | 6.55 | 801.2 | 0.3339 | 0.3278 |
| 31 | 1140.00 | 5000 | 6.549 | 801.2 | 0.3351 | 0.329 |
| 32 | 1200.00 | 5000 | 6.549 | 801.2 | 0.3351 | 0.329 |
| 33 | 1260.00 | 5000 | 6.547 | 801.2 | 0.3315 | 0.3254 |
| 34 | 1320.00 | 5001 | 6.55 | 802.8 | 0.3363 | 0.3302 |
| 35 | 1380.00 | 5000 | 6.551 | 801.2 | 0.3339 | 0.3278 |
| 36 | 1440.00 | 5000 | 6.552 | 801.2 | 0.3339 | 0.3278 |
| 37 | 1500.00 | 5001 | 6.55 | 801.2 | 0.3363 | 0.3302 |
| 38 | 1560.00 | 5000 | 6.549 | 801.2 | 0.3363 | 0.3302 |
| 39 | 1587.08 | 5000 | 6.549 | 801.2 | 0.3363 | 0.3302 |

# DIRECT SHEAR TEST DATA

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 7 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5000 | 6.549 | 801.2 | 0.3363 | 0.3302 |
| 2 | 0.01 | 5060 | 6.549 | 1002 | 0.3388 | 0.3327 |

# DIRECT SHEAR TEST DATA

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 5000 PSF

Location: RICO, COLORADO
Tested By: BCM
Test Date: 11/7/11
Sample Type: TRIMMED

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: -----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 8 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5107 | 6.549 | 1165 | 0.368 | 0.3327 |
| 2 | 0.10 | 4978 | 6.549 | 1051 | 0.3887 | 0.3534 |
| 3 | 0.25 | 5000 | 6.549 | 1018 | 0.3826 | 0.3473 |
| 4 | 0.50 | 5000 | 6.549 | 1004 | 0.3814 | 0.3461 |
| 5 | 1.00 | 5000 | 6.55 | 997.2 | 0.3802 | 0.3449 |
| 6 | 2.00 | 5000 | 6.549 | 998.8 | 0.3851 | 0.3497 |
| 7 | 4.00 | 5000 | 6.55 | 1000 | 0.39 | 0.3546 |
| 8 | 9.00 | 5000 | 6.549 | 1000 | 0.396 | 0.3607 |
| 9 | 16.00 | 5001 | 6.549 | 1002 | 0.4009 | 0.3656 |
| 10 | 25.00 | 5000 | 6.55 | 1002 | 0.4034 | 0.368 |
| 11 | 36.00 | 5000 | 6.549 | 1000 | 0.4046 | 0.3692 |
| 12 | 49.00 | 5000 | 6.549 | 1002 | 0.4046 | 0.3692 |
| 13 | 64.00 | 5000 | 6.549 | 1002 | 0.407 | 0.3717 |
| 14 | 120.00 | 5000 | 6.549 | 1002 | 0.4094 | 0.3741 |
| 15 | 180.00 | 5000 | 6.549 | 1002 | 0.4082 | 0.3729 |
| 16 | 240.00 | 5000 | 6.549 | 1002 | 0.4082 | 0.3729 |
| 17 | 300.00 | 5000 | 6.549 | 1002 | 0.4094 | 0.3741 |
| 18 | 360.00 | 5000 | 6.547 | 1000 | 0.4082 | 0.3729 |
| 19 | 420.00 | 5000 | 6.548 | 1000 | 0.4107 | 0.3753 |
| 20 | 480.00 | 5000 | 6.549 | 1002 | 0.4143 | 0.379 |
| 21 | 540.00 | 5000 | 6.551 | 1002 | 0.4192 | 0.3839 |
| 22 | 600.00 | 5000 | 6.552 | 1002 | 0.4204 | 0.3851 |
| 23 | 660.00 | 5000 | 6.551 | 1002 | 0.4192 | 0.3839 |
| 24 | 720.00 | 5000 | 6.551 | 1002 | 0.4216 | 0.3863 |
| 25 | 780.00 | 5000 | 6.55 | 1002 | 0.4216 | 0.3863 |
| 26 | 840.00 | 5000 | 6.552 | 1002 | 0.4241 | 0.3887 |
| 27 | 900.00 | 5000 | 6.552 | 1002 | 0.4241 | 0.3887 |
| 28 | 960.00 | 5000 | 6.553 | 1002 | 0.4265 | 0.3912 |
| 29 | 1020.00 | 5001 | 6.555 | 1002 | 0.4277 | 0.3924 |
| 30 | 1080.00 | 5000 | 6.554 | 1002 | 0.4289 | 0.3936 |
| 31 | 1140.00 | 5000 | 6.553 | 1002 | 0.4277 | 0.3924 |
| 32 | 1200.00 | 5000 | 6.554 | 1004 | 0.4326 | 0.3973 |
| 33 | 1260.00 | 5000 | 6.553 | 1002 | 0.435 | 0.3997 |
| 34 | 1320.00 | 5000 | 6.552 | 1002 | 0.435 | 0.3997 |
| 35 | 1380.00 | 5000 | 6.549 | 1002 | 0.4387 | 0.4034 |
| 36 | 1440.00 | 5000 | 6.55 | 1002 | 0.4411 | 0.4058 |
| 37 | 1500.00 | 5000 | 6.549 | 1002 | 0.446 | 0.4107 |
| 38 | 1560.00 | 5000 | 6.549 | 1004 | 0.446 | 0.4107 |
| 39 | 1620.00 | 5000 | 6.547 | 1002 | 0.4472 | 0.4119 |
| 40 | 1680.00 | 5000 | 6.548 | 1002 | 0.4521 | 0.4168 |
| 41 | 1740.00 | 5000 | 6.548 | 1002 | 0.4558 | 0.4204 |
| 42 | 1800.00 | 5000 | 6.548 | 1002 | 0.4558 | 0.4204 |
| 43 | 1860.00 | 5000 | 6.546 | 1002 | 0.4558 | 0.4204 |
| 44 | 1920.00 | 5000 | 6.546 | 1002 | 0.4558 | 0.4204 |
| 45 | 1980.00 | 5000 | 6.549 | 1004 | 0.4594 | 0.4241 |
| 46 | 2040.00 | 5000 | 6.552 | 1002 | 0.4631 | 0.4277 |
| 47 | 2100.00 | 5000 | 6.551 | 1002 | 0.4655 | 0.4302 |
| 48 | 2160.00 | 5000 | 6.551 | 1002 | 0.4655 | 0.4302 |
| 49 | 2220.00 | 5000 | 6.552 | 1002 | 0.4667 | 0.4314 |
| 50 | 2280.00 | 5000 | 6.553 | 1000 | 0.4679 | 0.4326 |
| 51 | 2340.00 | 5000 | 6.554 | 1002 | 0.4679 | 0.4326 |
| 52 | 2400.00 | 5000 | 6.554 | 1002 | 0.4679 | 0.4326 |
| 53 | 2460.00 | 5000 | 6.555 | 1002 | 0.4704 | 0.435 |
| 54 | 2520.00 | 5000 | 6.556 | 1002 | 0.4716 | 0.4363 |
| 55 | 2580.00 | 5000 | 6.556 | 1002 | 0.4728 | 0.4375 |
| 56 | 2640.00 | 5000 | 6.557 | 1002 | 0.474 | 0.4387 |
| 57 | 2700.00 | 5000 | 6.556 | 1002 | 0.4765 | 0.4411 |
| 58 | 2760.00 | 5000 | 6.558 | 1002 | 0.4777 | 0.4424 |
| 59 | 2820.00 | 5000 | 6.558 | 1002 | 0.4813 | 0.446 |
| 60 | 2880.00 | 5000 | 6.558 | 1002 | 0.4838 | 0.4484 |
| 61 | 2940.00 | 5000 | 6.558 | 1002 | 0.4826 | 0.4472 |
| 62 | 3000.00 | 5000 | 6.559 | 1002 | 0.4862 | 0.4509 |
| 63 | 3060.00 | 5000 | 6.561 | 1002 | 0.4887 | 0.4533 |
| 64 | 3120.00 | 5000 | 6.562 | 1002 | 0.4899 | 0.4545 |
| 65 | 3180.00 | 5000 | 6.563 | 1004 | 0.4911 | 0.4558 |
| 66 | 3240.00 | 5000 | 6.562 | 1002 | 0.4923 | 0.457 |
| 67 | 3300.00 | 5000 | 6.565 | 1002 | 0.496 | 0.4606 |
| 68 | 3360.00 | 5000 | 6.567 | 1002 | 0.4996 | 0.4643 |
| 69 | 3420.00 | 5000 | 6.568 | 1002 | 0.5021 | 0.4667 |
| 70 | 3480.00 | 5000 | 6.569 | 1002 | 0.5045 | 0.4692 |
| 71 | 3540.00 | 5000 | 6.571 | 1002 | 0.5094 | 0.474 |
| 72 | 3600.00 | 5000 | 6.573 | 1002 | 0.513 | 0.4777 |
| 73 | 3660.00 | 5000 | 6.576 | 1002 | 0.5167 | 0.4813 |
| 74 | 3720.00 | 5000 | 6.577 | 1002 | 0.5216 | 0.4862 |
| 75 | 3780.00 | 5000 | 6.58 | 1002 | 0.5252 | 0.4899 |
| 76 | 3840.00 | 5000 | 6.58 | 1002 | 0.5289 | 0.4935 |
| 77 | 3900.00 | 5000 | 6.581 | 1002 | 0.5313 | 0.496 |
| 78 | 3960.00 | 5000 | 6.582 | 1002 | 0.5325 | 0.4972 |
| 79 | 4020.00 | 4998 | 6.582 | 1002 | 0.5325 | 0.4972 |
| 80 | 4080.00 | 5000 | 6.583 | 1002 | 0.5325 | 0.4972 |
| 81 | 4140.00 | 5000 | 6.582 | 1002 | 0.535 | 0.4996 |
| 82 | 4200.00 | 5000 | 6.582 | 1000 | 0.535 | 0.4996 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 83 | 4260.00 | 5000 | 6.582 | 1002 | 0.5362 | 0.5008 |
| 84 | 4320.00 | 5000 | 6.581 | 1002 | 0.5362 | 0.5008 |
| 85 | 4380.00 | 5001 | 6.58 | 1002 | 0.5337 | 0.4984 |
| 86 | 4440.00 | 5000 | 6.581 | 1002 | 0.5362 | 0.5008 |
| 87 | 4500.00 | 5000 | 6.58 | 1002 | 0.5337 | 0.4984 |
| 88 | 4560.00 | 5000 | 6.579 | 1002 | 0.5337 | 0.4984 |
| 89 | 4620.00 | 5000 | 6.578 | 1002 | 0.5325 | 0.4972 |
| 90 | 4680.00 | 5000 | 6.578 | 1002 | 0.5325 | 0.4972 |
| 91 | 4740.00 | 5000 | 6.579 | 1002 | 0.5337 | 0.4984 |
| 92 | 4800.00 | 5000 | 6.579 | 1004 | 0.535 | 0.4996 |
| 93 | 4860.00 | 5000 | 6.58 | 1002 | 0.535 | 0.4996 |
| 94 | 4920.00 | 5000 | 6.579 | 1002 | 0.5325 | 0.4972 |
| 95 | 4980.00 | 5000 | 6.579 | 1002 | 0.5337 | 0.4984 |
| 96 | 5040.00 | 5000 | 6.579 | 1002 | 0.535 | 0.4996 |
| 97 | 5100.00 | 5000 | 6.579 | 1002 | 0.535 | 0.4996 |
| 98 | 5160.00 | 5000 | 6.58 | 1002 | 0.5362 | 0.5008 |
| 99 | 5220.00 | 5000 | 6.58 | 1002 | 0.535 | 0.4996 |
| 100 | 5280.00 | 5000 | 6.58 | 1002 | 0.535 | 0.4996 |
| 101 | 5340.00 | 5000 | 6.58 | 1002 | 0.5362 | 0.5008 |
| 102 | 5400.00 | 5001 | 6.58 | 1002 | 0.535 | 0.4996 |
| 103 | 5460.00 | 4998 | 6.579 | 1002 | 0.5325 | 0.4972 |
| 104 | 5520.00 | 5000 | 6.578 | 1002 | 0.5337 | 0.4984 |
| 105 | 5580.00 | 5000 | 6.578 | 1002 | 0.5337 | 0.4984 |
| 106 | 5619.41 | 5000 | 6.578 | 1002 | 0.5325 | 0.4972 |

# DIRECT SHEAR TEST DATA

| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 9 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5000 | 6.578 | 1002 | 0.5325 | 0.4972 |
| 2 | 0.02 | 5102 | 6.578 | 1358 | 0.5398 | 0.5045 |

## DIRECT SHEAR TEST DATA

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 5000 PSF

Location: RICO, COLORADO
Tested By: BCM
Test Date: 11/7/11
Sample Type: TRIMMED

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: -----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 10 of 12

|  | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5143 | 6.578 | 1512 | 0.5764 | 0.5045 |
| 2 | 0.10 | 4986 | 6.578 | 1383 | 0.5983 | 0.5264 |
| 3 | 0.25 | 4998 | 6.578 | 1359 | 0.5971 | 0.5252 |
| 4 | 0.50 | 5000 | 6.579 | 1348 | 0.5971 | 0.5252 |
| 5 | 1.00 | 5000 | 6.579 | 1350 | 0.6008 | 0.5289 |
| 6 | 2.00 | 5000 | 6.579 | 1356 | 0.6032 | 0.5313 |
| 7 | 4.00 | 5000 | 6.58 | 1356 | 0.6044 | 0.5325 |
| 8 | 9.00 | 5000 | 6.58 | 1356 | 0.6056 | 0.5337 |
| 9 | 16.00 | 5000 | 6.58 | 1356 | 0.6093 | 0.5374 |
| 10 | 25.00 | 5000 | 6.58 | 1358 | 0.6117 | 0.5398 |
| 11 | 36.00 | 5000 | 6.58 | 1358 | 0.6142 | 0.5423 |
| 12 | 49.00 | 5000 | 6.58 | 1358 | 0.6154 | 0.5435 |
| 13 | 64.00 | 5000 | 6.58 | 1358 | 0.6166 | 0.5447 |
| 14 | 120.00 | 5000 | 6.58 | 1356 | 0.6203 | 0.5484 |
| 15 | 180.00 | 5000 | 6.582 | 1358 | 0.6251 | 0.5532 |
| 16 | 240.00 | 5000 | 6.583 | 1358 | 0.6325 | 0.5606 |
| 17 | 300.00 | 5000 | 6.583 | 1358 | 0.6373 | 0.5654 |
| 18 | 360.00 | 5000 | 6.583 | 1358 | 0.6422 | 0.5703 |
| 19 | 420.00 | 5000 | 6.585 | 1358 | 0.6471 | 0.5752 |
| 20 | 480.00 | 5001 | 6.589 | 1358 | 0.6507 | 0.5788 |
| 21 | 540.00 | 5000 | 6.591 | 1358 | 0.6532 | 0.5813 |
| 22 | 600.00 | 5000 | 6.591 | 1358 | 0.6556 | 0.5837 |
| 23 | 660.00 | 5000 | 6.594 | 1358 | 0.6605 | 0.5886 |
| 24 | 720.00 | 5000 | 6.596 | 1358 | 0.6617 | 0.5898 |
| 25 | 780.00 | 4998 | 6.595 | 1358 | 0.6641 | 0.5922 |
| 26 | 840.00 | 5001 | 6.597 | 1358 | 0.6666 | 0.5947 |
| 27 | 900.00 | 5000 | 6.598 | 1358 | 0.669 | 0.5971 |
| 28 | 960.00 | 5000 | 6.599 | 1358 | 0.6739 | 0.602 |
| 29 | 1020.00 | 5000 | 6.6 | 1358 | 0.6763 | 0.6044 |
| 30 | 1080.00 | 5000 | 6.601 | 1358 | 0.6788 | 0.6069 |
| 31 | 1140.00 | 5001 | 6.602 | 1358 | 0.6824 | 0.6105 |
| 32 | 1200.00 | 5000 | 6.603 | 1358 | 0.6824 | 0.6105 |
| 33 | 1260.00 | 5000 | 6.602 | 1358 | 0.6824 | 0.6105 |
| 34 | 1320.00 | 5000 | 6.602 | 1358 | 0.6873 | 0.6154 |
| 35 | 1380.00 | 5000 | 6.6 | 1358 | 0.6885 | 0.6166 |
| 36 | 1440.00 | 5000 | 6.6 | 1358 | 0.6922 | 0.6203 |
| 37 | 1500.00 | 5000 | 6.598 | 1358 | 0.6946 | 0.6227 |
| 38 | 1560.00 | 5000 | 6.6 | 1358 | 0.697 | 0.6251 |
| 39 | 1620.00 | 5000 | 6.599 | 1356 | 0.6983 | 0.6264 |
| 40 | 1680.00 | 5000 | 6.601 | 1358 | 0.7019 | 0.63 |
| 41 | 1740.00 | 5000 | 6.602 | 1358 | 0.7031 | 0.6312 |
| 42 | 1800.00 | 4998 | 6.603 | 1358 | 0.7092 | 0.6373 |
| 43 | 1860.00 | 5000 | 6.604 | 1358 | 0.7129 | 0.641 |
| 44 | 1920.00 | 5001 | 6.603 | 1358 | 0.7129 | 0.641 |
| 45 | 1980.00 | 5001 | 6.605 | 1358 | 0.7178 | 0.6459 |
| 46 | 2040.00 | 5000 | 6.605 | 1358 | 0.7202 | 0.6483 |
| 47 | 2100.00 | 5000 | 6.606 | 1358 | 0.7214 | 0.6495 |
| 48 | 2160.00 | 5001 | 6.609 | 1358 | 0.7287 | 0.6568 |
| 49 | 2220.00 | 5000 | 6.628 | 1358 | 0.758 | 0.6861 |
| 50 | 2280.00 | 5000 | 6.623 | 1358 | 0.7567 | 0.6849 |
| 51 | 2340.00 | 5000 | 6.638 | 1358 | 0.775 | 0.7031 |
| 52 | 2400.00 | 5001 | 6.643 | 1358 | 0.7884 | 0.7165 |
| 53 | 2460.00 | 5000 | 6.637 | 1358 | 0.7787 | 0.7068 |
| 54 | 2520.00 | 5000 | 6.632 | 1358 | 0.7714 | 0.6995 |
| 55 | 2580.00 | 5000 | 6.627 | 1358 | 0.7641 | 0.6922 |
| 56 | 2640.00 | 5000 | 6.624 | 1358 | 0.7592 | 0.6873 |
| 57 | 2700.00 | 5000 | 6.621 | 1358 | 0.7543 | 0.6824 |
| 58 | 2760.00 | 5000 | 6.618 | 1358 | 0.7507 | 0.6788 |
| 59 | 2820.00 | 5000 | 6.618 | 1358 | 0.747 | 0.6751 |
| 60 | 2880.00 | 5000 | 6.615 | 1358 | 0.7458 | 0.6739 |
| 61 | 2940.00 | 5000 | 6.612 | 1358 | 0.7446 | 0.6727 |
| 62 | 2989.89 | 5000 | 6.613 | 1358 | 0.7421 | 0.6702 |

# DIRECT SHEAR TEST DATA

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 5000 PSF

Location: RICO, COLORADO
Tested By: BCM
Test Date: 11/7/11
Sample Type: TRIMMED

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: -----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

Step: 11 of 12

| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5000 | 6.613 | 1358 | 0.7409 | 0.6702 |
| 2 | 0.01 | 5045 | 6.612 | 1538 | 0.7409 | 0.6702 |

# DIRECT SHEAR TEST DATA

Project: RICO ARGENTINE SITE OU01
Boring No.: ST18-3
Sample No.: ST18-3
Test No.: 5000 PSF

Location: RICO, COLORADO
Tested By: BCM
Test Date: 11/7/11
Sample Type: TRIMMED

Project No.: 60157757
Checked By: WPQ
Depth: 12.0"-42.0"
Elevation: -----

Soil Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN
Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION

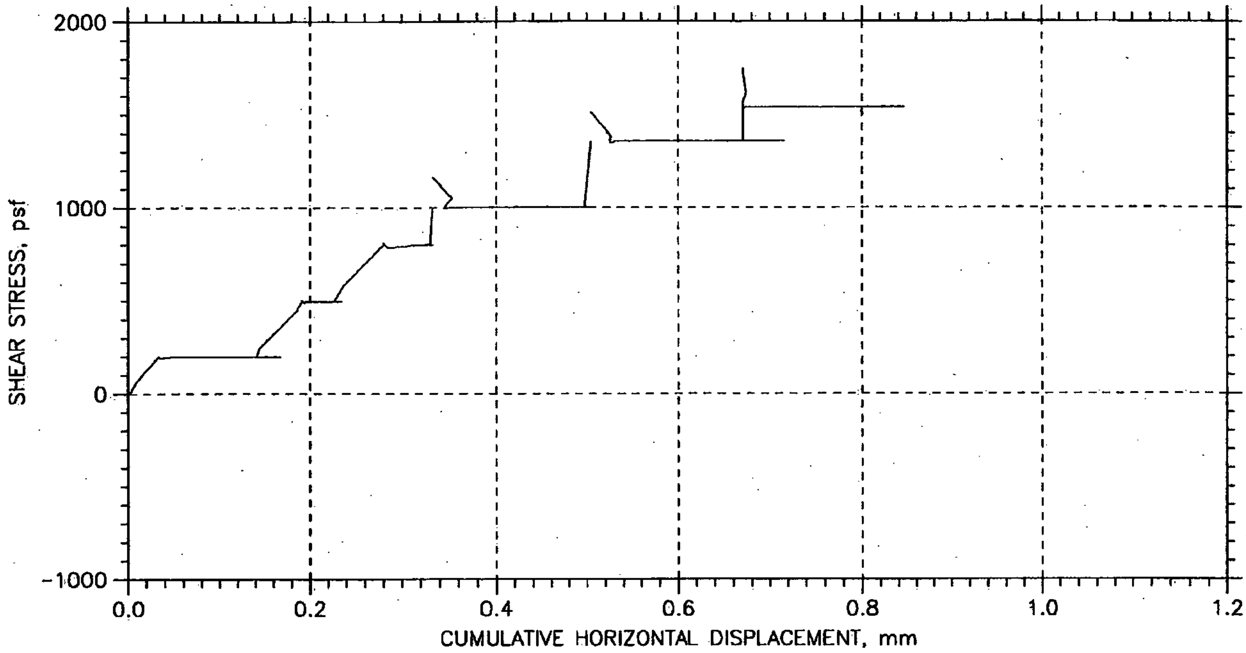
Step: 12 of 12

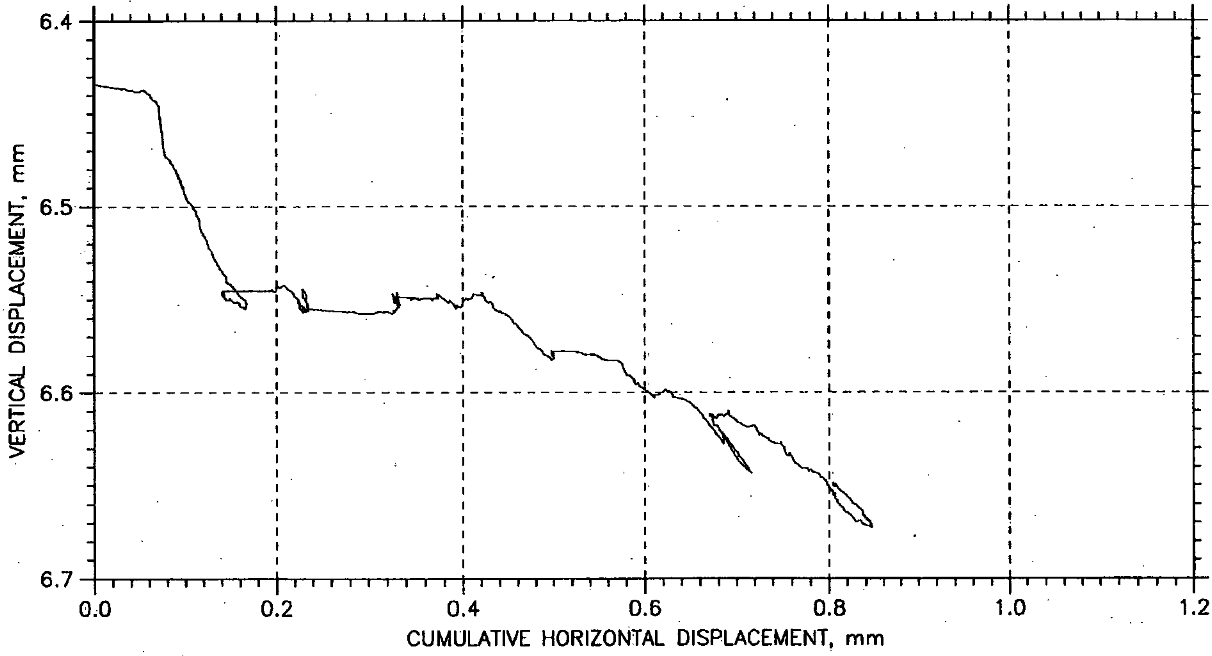
| | Elapsed Time min | Vertical Stress psf | Vertical Displacement mm | Horizontal Stress psf | Horizontal Displacement mm | Cumulative Displacement mm |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 5104 | 6.612 | 1747 | 0.7567 | 0.6702 |
| 2 | 0.10 | 4979 | 6.612 | 1613 | 0.7604 | 0.6739 |
| 3 | 0.25 | 5000 | 6.611 | 1563 | 0.7567 | 0.6702 |
| 4 | 0.50 | 5000 | 6.611 | 1541 | 0.7567 | 0.6702 |
| 5 | 1.00 | 5000 | 6.611 | 1537 | 0.7567 | 0.6702 |
| 6 | 2.00 | 5000 | 6.613 | 1530 | 0.7567 | 0.6702 |
| 7 | 4.00 | 5000 | 6.613 | 1538 | 0.7592 | 0.6727 |
| 8 | 9.00 | 5000 | 6.614 | 1538 | 0.7641 | 0.6775 |
| 9 | 16.00 | 5000 | 6.613 | 1538 | 0.7628 | 0.6763 |
| 10 | 25.00 | 5000 | 6.614 | 1538 | 0.7641 | 0.6775 |
| 11 | 36.00 | 5000 | 6.613 | 1538 | 0.7653 | 0.6788 |
| 12 | 49.00 | 5000 | 6.612 | 1538 | 0.7653 | 0.6788 |
| 13 | 64.00 | 5000 | 6.612 | 1538 | 0.7677 | 0.6812 |
| 14 | 120.00 | 5000 | 6.612 | 1538 | 0.7702 | 0.6836 |
| 15 | 180.00 | 5000 | 6.613 | 1538 | 0.7726 | 0.6861 |
| 16 | 240.00 | 5000 | 6.611 | 1538 | 0.7762 | 0.6897 |
| 17 | 300.00 | 5000 | 6.611 | 1538 | 0.7787 | 0.6922 |
| 18 | 360.00 | 5001 | 6.611 | 1538 | 0.7787 | 0.6922 |
| 19 | 420.00 | 5000 | 6.61 | 1538 | 0.7775 | 0.6909 |
| 20 | 480.00 | 5000 | 6.612 | 1538 | 0.7775 | 0.6909 |
| 21 | 540.00 | 5000 | 6.615 | 1538 | 0.786 | 0.6995 |
| 22 | 600.00 | 5000 | 6.616 | 1538 | 0.7872 | 0.7007 |
| 23 | 660.00 | 5000 | 6.616 | 1538 | 0.7909 | 0.7043 |
| 24 | 720.00 | 5000 | 6.618 | 1538 | 0.7945 | 0.708 |
| 25 | 780.00 | 5000 | 6.619 | 1538 | 0.7994 | 0.7129 |
| 26 | 840.00 | 5000 | 6.618 | 1538 | 0.8067 | 0.7202 |
| 27 | 900.00 | 5000 | 6.62 | 1540 | 0.8091 | 0.7226 |
| 28 | 960.00 | 5000 | 6.623 | 1538 | 0.8116 | 0.7251 |
| 29 | 1020.00 | 5000 | 6.622 | 1538 | 0.814 | 0.7275 |
| 30 | 1080.00 | 5000 | 6.624 | 1538 | 0.8152 | 0.7287 |
| 31 | 1140.00 | 5000 | 6.625 | 1538 | 0.8189 | 0.7324 |
| 32 | 1200.00 | 5000 | 6.625 | 1538 | 0.8213 | 0.7348 |
| 33 | 1260.00 | 5000 | 6.626 | 1538 | 0.8226 | 0.736 |
| 34 | 1320.00 | 5000 | 6.627 | 1538 | 0.8262 | 0.7397 |
| 35 | 1380.00 | 5000 | 6.627 | 1538 | 0.8274 | 0.7409 |
| 36 | 1440.00 | 5000 | 6.628 | 1538 | 0.8299 | 0.7433 |
| 37 | 1500.00 | 4998 | 6.628 | 1538 | 0.8323 | 0.7458 |
| 38 | 1560.00 | 5000 | 6.628 | 1538 | 0.8347 | 0.7482 |
| 39 | 1620.00 | 5000 | 6.627 | 1538 | 0.8347 | 0.7482 |
| 40 | 1680.00 | 4998 | 6.63 | 1538 | 0.8384 | 0.7519 |
| 41 | 1740.00 | 4998 | 6.629 | 1538 | 0.8384 | 0.7519 |
| 42 | 1800.00 | 5000 | 6.632 | 1538 | 0.8396 | 0.7531 |
| 43 | 1860.00 | 5000 | 6.634 | 1538 | 0.8408 | 0.7543 |
| 44 | 1920.00 | 5000 | 6.634 | 1537 | 0.8433 | 0.7567 |
| 45 | 1980.00 | 5000 | 6.633 | 1538 | 0.8445 | 0.758 |
| 46 | 2040.00 | 5000 | 6.635 | 1538 | 0.8469 | 0.7604 |
| 47 | 2100.00 | 5000 | 6.637 | 1538 | 0.8494 | 0.7628 |
| 48 | 2160.00 | 4998 | 6.638 | 1538 | 0.8506 | 0.7641 |
| 49 | 2220.00 | 5000 | 6.638 | 1538 | 0.853 | 0.7665 |
| 50 | 2280.00 | 5000 | 6.639 | 1538 | 0.8542 | 0.7677 |
| 51 | 2340.00 | 5000 | 6.641 | 1540 | 0.8579 | 0.7714 |
| 52 | 2400.00 | 5000 | 6.641 | 1538 | 0.8591 | 0.7726 |
| 53 | 2460.00 | 5000 | 6.641 | 1538 | 0.8615 | 0.775 |
| 54 | 2520.00 | 5000 | 6.641 | 1538 | 0.8628 | 0.7762 |
| 55 | 2580.00 | 5000 | 6.643 | 1538 | 0.8652 | 0.7787 |
| 56 | 2640.00 | 5000 | 6.642 | 1538 | 0.8652 | 0.7787 |
| 57 | 2700.00 | 5001 | 6.642 | 1538 | 0.8676 | 0.7811 |
| 58 | 2760.00 | 5000 | 6.643 | 1538 | 0.8689 | 0.7823 |
| 59 | 2820.00 | 5000 | 6.643 | 1538 | 0.8689 | 0.7823 |
| 60 | 2880.00 | 5000 | 6.643 | 1538 | 0.8701 | 0.7836 |
| 61 | 2940.00 | 5000 | 6.643 | 1537 | 0.8713 | 0.7848 |
| 62 | 3000.00 | 5000 | 6.643 | 1538 | 0.8737 | 0.7872 |
| 63 | 3060.00 | 5000 | 6.644 | 1538 | 0.875 | 0.7884 |
| 64 | 3120.00 | 5000 | 6.644 | 1538 | 0.8762 | 0.7896 |
| 65 | 3180.00 | 5001 | 6.646 | 1538 | 0.8774 | 0.7909 |
| 66 | 3240.00 | 5000 | 6.646 | 1538 | 0.8786 | 0.7921 |
| 67 | 3300.00 | 5000 | 6.646 | 1538 | 0.8786 | 0.7921 |
| 68 | 3360.00 | 5000 | 6.646 | 1540 | 0.8798 | 0.7933 |
| 69 | 3420.00 | 5000 | 6.647 | 1538 | 0.8823 | 0.7957 |
| 70 | 3480.00 | 4998 | 6.647 | 1538 | 0.8835 | 0.797 |
| 71 | 3540.00 | 5000 | 6.65 | 1538 | 0.8847 | 0.7982 |
| 72 | 3600.00 | 5000 | 6.652 | 1538 | 0.8871 | 0.8006 |
| 73 | 3660.00 | 5000 | 6.651 | 1538 | 0.8859 | 0.7994 |
| 74 | 3720.00 | 5000 | 6.653 | 1538 | 0.8884 | 0.8018 |
| 75 | 3780.00 | 5000 | 6.652 | 1538 | 0.8896 | 0.8031 |
| 76 | 3840.00 | 5001 | 6.653 | 1538 | 0.8908 | 0.8043 |
| 77 | 3900.00 | 4998 | 6.656 | 1538 | 0.892 | 0.8055 |
| 78 | 3960.00 | 5000 | 6.654 | 1538 | 0.8932 | 0.8067 |
| 79 | 4020.00 | 5000 | 6.655 | 1538 | 0.8932 | 0.8067 |
| 80 | 4080.00 | 5000 | 6.656 | 1538 | 0.8932 | 0.8067 |
| 81 | 4140.00 | 5003 | 6.656 | 1538 | 0.8932 | 0.8067 |
| 82 | 4200.00 | 5001 | 6.657 | 1538 | 0.8932 | 0.8067 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 83 | 4260.00 | 5000 | 6.658 | 1538 | 0.8957 | 0.8091 |
| 84 | 4320.00 | 5001 | 6.659 | 1538 | 0.8957 | 0.8091 |
| 85 | 4380.00 | 5000 | 6.659 | 1538 | 0.8957 | 0.8091 |
| 86 | 4440.00 | 5000 | 6.66 | 1538 | 0.8969 | 0.8104 |
| 87 | 4500.00 | 5000 | 6.661 | 1538 | 0.8993 | 0.8128 |
| 88 | 4560.00 | 5000 | 6.662 | 1538 | 0.9018 | 0.8152 |
| 89 | 4620.00 | 5000 | 6.665 | 1538 | 0.9042 | 0.8177 |
| 90 | 4680.00 | 5000 | 6.665 | 1538 | 0.9066 | 0.8201 |
| 91 | 4740.00 | 5001 | 6.665 | 1538 | 0.9091 | 0.8226 |
| 92 | 4800.00 | 5000 | 6.667 | 1540 | 0.9127 | 0.8262 |
| 93 | 4860.00 | 5000 | 6.67 | 1538 | 0.9152 | 0.8286 |
| 94 | 4920.00 | 5000 | 6.67 | 1538 | 0.9176 | 0.8311 |
| 95 | 4980.00 | 5000 | 6.669 | 1540 | 0.9213 | 0.8347 |
| 96 | 5040.00 | 5000 | 6.67 | 1538 | 0.9225 | 0.836 |
| 97 | 5100.00 | 4998 | 6.671 | 1538 | 0.9249 | 0.8384 |
| 98 | 5160.00 | 5000 | 6.672 | 1540 | 0.9298 | 0.8433 |
| 99 | 5220.00 | 5000 | 6.672 | 1538 | 0.931 | 0.8445 |
| 100 | 5280.00 | 5000 | 6.672 | 1538 | 0.931 | 0.8445 |
| 101 | 5340.00 | 5000 | 6.671 | 1538 | 0.9322 | 0.8457 |
| 102 | 5400.00 | 5000 | 6.673 | 1538 | 0.9322 | 0.8457 |
| 103 | 5460.00 | 5001 | 6.672 | 1538 | 0.9334 | 0.8469 |
| 104 | 5520.00 | 5000 | 6.67 | 1538 | 0.9322 | 0.8457 |
| 105 | 5580.00 | 5001 | 6.67 | 1540 | 0.931 | 0.8445 |
| 106 | 5640.00 | 4998 | 6.67 | 1538 | 0.931 | 0.8445 |
| 107 | 5700.00 | 5001 | 6.669 | 1538 | 0.931 | 0.8445 |
| 108 | 5760.00 | 5001 | 6.67 | 1538 | 0.9298 | 0.8433 |
| 109 | 5820.00 | 5001 | 6.668 | 1540 | 0.9286 | 0.842 |
| 110 | 5880.00 | 5000 | 6.669 | 1538 | 0.9286 | 0.842 |
| 111 | 5940.00 | 4998 | 6.669 | 1538 | 0.9286 | 0.842 |
| 112 | 6000.00 | 5000 | 6.669 | 1538 | 0.9274 | 0.8408 |
| 113 | 6060.00 | 5000 | 6.668 | 1538 | 0.9274 | 0.8408 |
| 114 | 6120.00 | 5000 | 6.668 | 1538 | 0.9261 | 0.8396 |
| 115 | 6180.00 | 5000 | 6.667 | 1538 | 0.9261 | 0.8396 |
| 116 | 6240.00 | 5000 | 6.666 | 1538 | 0.9249 | 0.8384 |
| 117 | 6300.00 | 5000 | 6.666 | 1538 | 0.9249 | 0.8384 |
| 118 | 6360.00 | 5000 | 6.666 | 1538 | 0.9237 | 0.8372 |
| 119 | 6420.00 | 5003 | 6.664 | 1538 | 0.9237 | 0.8372 |
| 120 | 6480.00 | 4998 | 6.664 | 1538 | 0.9237 | 0.8372 |
| 121 | 6540.00 | 5000 | 6.664 | 1538 | 0.9237 | 0.8372 |
| 122 | 6600.00 | 4998 | 6.664 | 1538 | 0.9225 | 0.836 |
| 123 | 6660.00 | 5000 | 6.663 | 1538 | 0.9213 | 0.8347 |
| 124 | 6720.00 | 5000 | 6.662 | 1538 | 0.9188 | 0.8323 |
| 125 | 6780.00 | 5000 | 6.661 | 1538 | 0.9176 | 0.8311 |
| 126 | 6840.00 | 5000 | 6.661 | 1538 | 0.9164 | 0.8299 |
| 127 | 6900.00 | 5000 | 6.66 | 1538 | 0.9127 | 0.8262 |
| 128 | 6960.00 | 4998 | 6.659 | 1538 | 0.9115 | 0.825 |
| 129 | 7020.00 | 5000 | 6.657 | 1538 | 0.9091 | 0.8226 |
| 130 | 7080.00 | 5000 | 6.656 | 1537 | 0.9054 | 0.8189 |
| 131 | 7140.00 | 5000 | 6.655 | 1538 | 0.9042 | 0.8177 |
| 132 | 7200.00 | 5001 | 6.652 | 1538 | 0.8981 | 0.8116 |
| 133 | 7260.00 | 4998 | 6.651 | 1538 | 0.8957 | 0.8091 |
| 134 | 7320.00 | 5001 | 6.649 | 1540 | 0.8944 | 0.8079 |
| 135 | 7380.00 | 5001 | 6.651 | 1538 | 0.892 | 0.8055 |
| 136 | 7440.00 | 5001 | 6.648 | 1538 | 0.8908 | 0.8043 |

0

# RESIDUAL SHEAR TEST

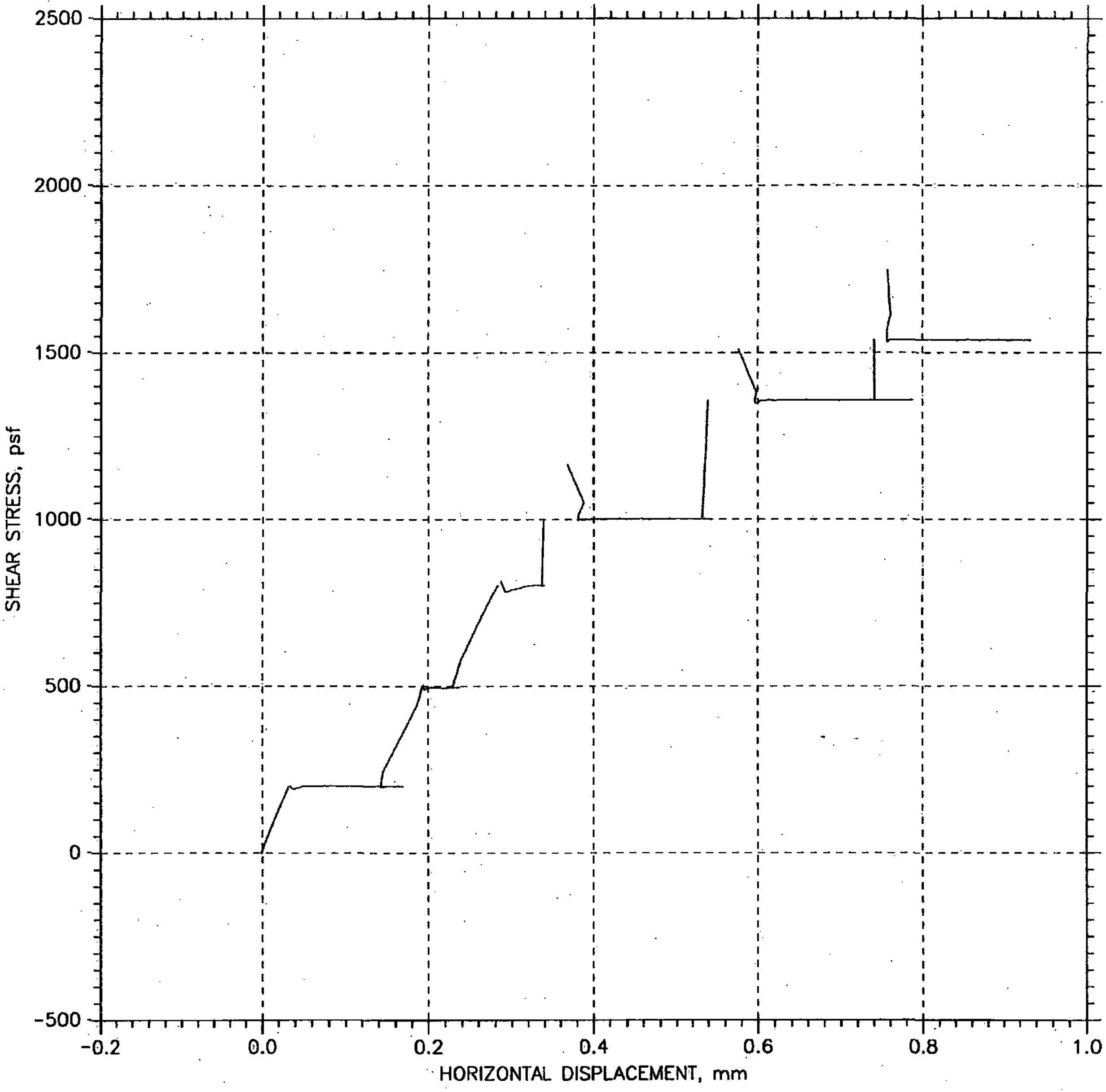




| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN | | |
| Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION | | |
| File: C:\GeoComp_SHEAR\Software\Shear\RICO\CONSTANT LOAD TEST ST18-3 5000 PSF\ST18-3 5000 PSF trial 2.dat | | |

Mon, 28-NOV-2011 14:11:29

# RESIDUAL SHEAR TEST



| | | |
|---|---|---|
| Project: RICO ARGENTINE SITE OU01 | Location: RICO, COLORADO | Project No.: 60157757 |
| Boring No.: ST18-3 | Tested By: BCM | Checked By: WPQ |
| Sample No.: ST18-3 | Test Date: 11/7/11 | Depth: 12.0"-42.0" |
| Test No.: 5000 PSF | Sample Type: TRIMMED | Elevation: ----- |
| Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN | | |
| Remarks: SPECIMEN SUBJECTD TO CONSTANT LOAD TO DETERMINE CREEP DEFORMATION | | |
| File: C:\GeoComp_SHEAR\Software\Shear\RICO\CONSTANT LOAD TEST ST18-3 5000 PSF\ST18-3 5000 PSF trial 2.dat | | |

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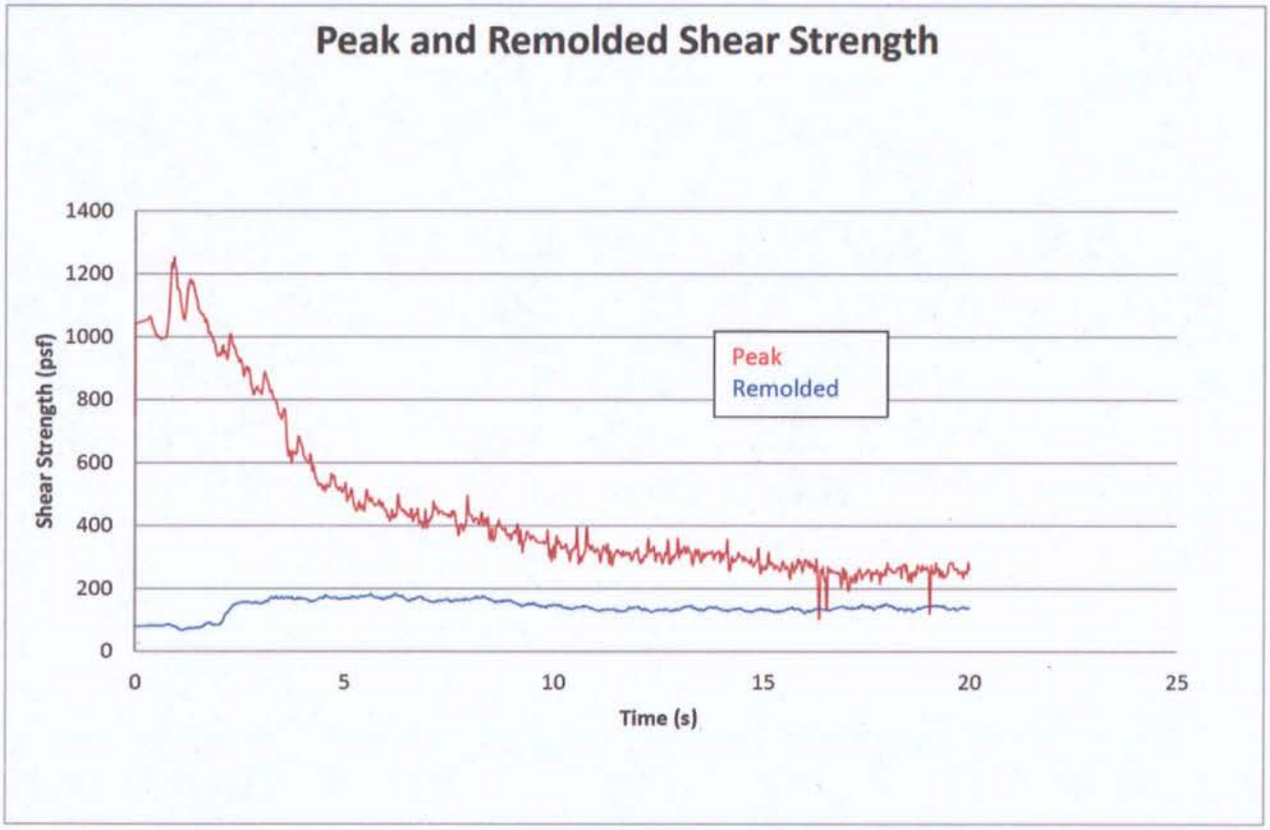
AECOM

## Laboratory Miniature Vane Shear Test for
## Saturated Fine-Grained Clayey Soil
## ASTM D 4648

750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone: (847) 279-2500 Fax: (847) 279-2550



| | | | | | |
|---|---|---|---|---|---|
| Project: | RICO ARGENTINE SITE OU01 | | | Test Depth in Sample: | 4.0" |
| Project No. | 60157757 | Vane: | Large | Remold Revolutions | 20 |
| Boring: | ST-18-2 | Diameter | 0.500 in. | Peak Shear Strength(psf): | 1245 |
| Sample No.: | Trial 2 | Height | 1.000 in. | Peak Remolded Strength(psf): | 271 |
| Depth (ft): | 0.0"-30.0" | K | 3772 ft$^{-3}$ | Sensitivity: | 4.6 |

Material Description: LIME TREATMENT SOLIDS - POND 18 - REDDISH BROWN

Moisture Content: 472.3%

Kingston Fly Ash Impoundment
- accumulated horiz. shear strain accelerates when applied shear stress reached 0.85 $S_u$
- corollary to avoid @ Rico
- do continuous sampling thru calcine tailings to detect weak layers, if any.

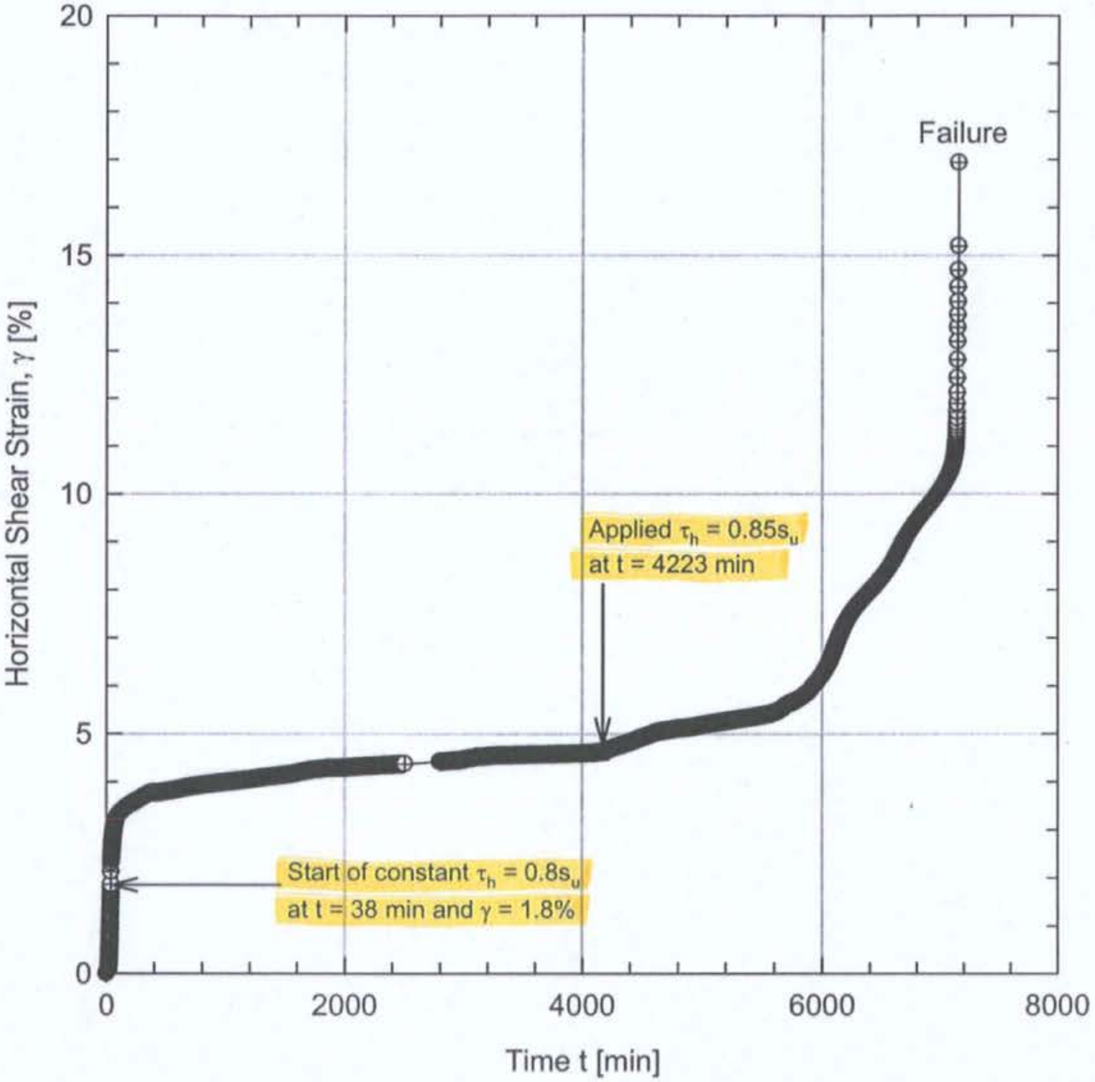
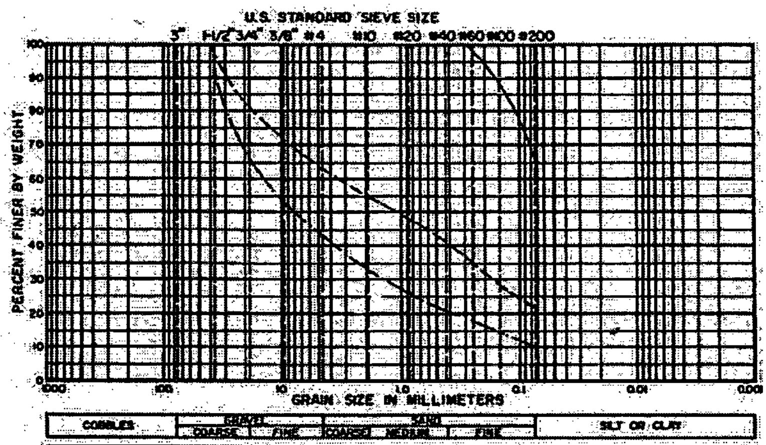


**Figure 5.4.65** Horizontal shear strain versus time for DSS creep test G361 on sample 09-100B S6 35.5-38.0 ft

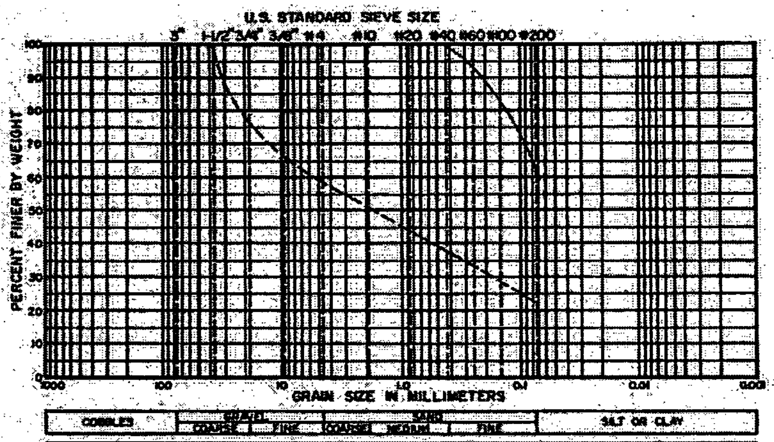
Softest fly ash/silt slimes from earliest deposition in fly ash pond ca 1950's.

Direct simple shear (DSS)
- modified from constant horiz. strain throughout, to hold $\tau_h$ @ 0.80 & 0.85 $S_u$

# Prior Laboratory Data

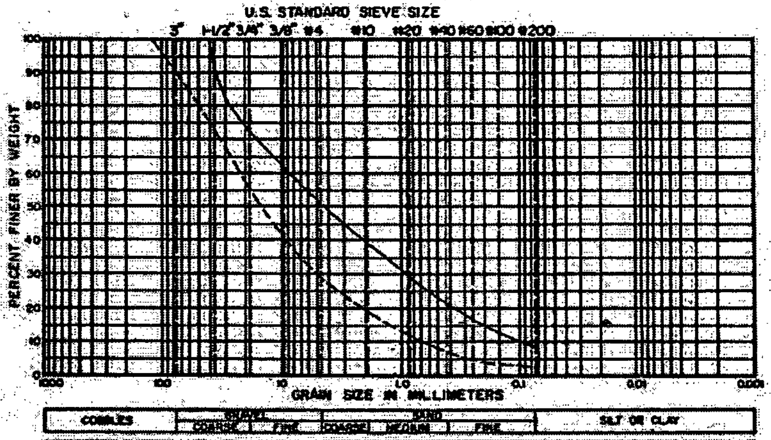


| LOCATION | DEPTH | CLASSIFICATION | KEY |
|---|---|---|---|
| ~~B-9~~ | ~~19.5 Feet~~ | ~~[illegible] Sandy Silt [illegible]~~ | ——— |
| B-2 | 8.5 Feet | Yellow and Brown Fine to Coarse Clayey Sand With Some Gravel (SC) | - - - - |
| B-8 | 9.5 Feet | Brown Sandy Fine Gravel With Clay (GM) | —·—·— |

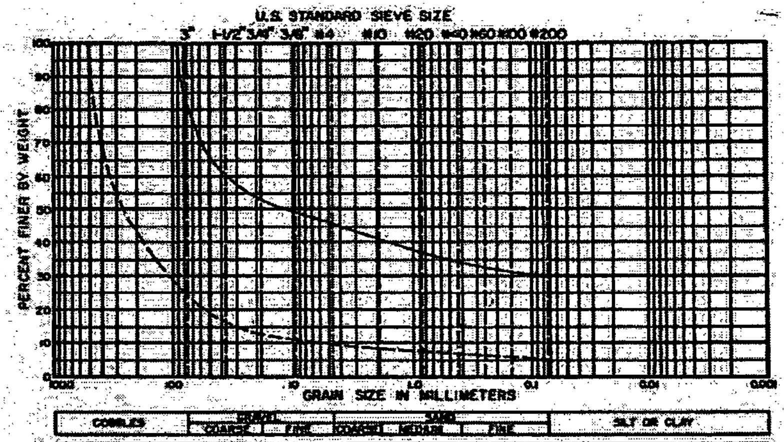


| LOCATION | DEPTH | CLASSIFICATION | KEY |
|---|---|---|---|
| ~~B-11~~ | ~~20 Feet~~ | ~~[illegible] Sandy Silt [illegible]~~ | ——— |
| B-4 | 9.5 Feet | Brown Fine to Coarse Clayey Sand With Gravel (SM-SC) | - - - - |

# GRADATION CURVES



| LOCATION | DEPTH | CLASSIFICATION | KEY |
|---|---|---|---|
| St. Louis Adit Borrow | Free Cut Above Adit | Brown to Lt. Brown Sandy Fine Gravel and Gravelly Fine to Coarse Sand With Silt (GW-SM) | ——— |
| ~~Near Boring B-13~~ | ~~0 to 1 Feet~~ | ~~[illegible] Sand (GW)~~ | ~~– – –~~ |

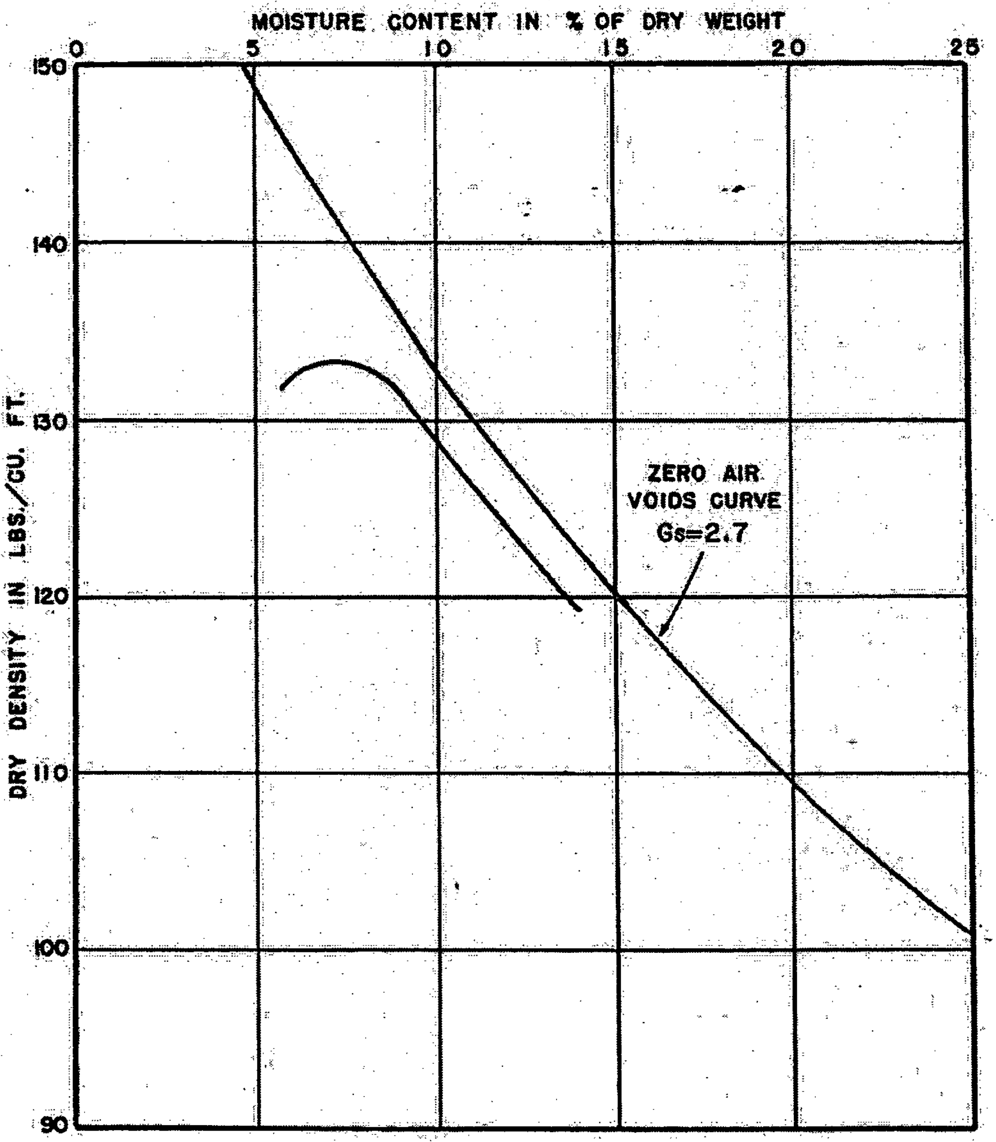


| LOCATION | DEPTH | CLASSIFICATION | KEY |
|---|---|---|---|
| Dolores River | River Bank | Brown Silty Clayey Fine to Coarse Gravel With Cobbles (GM-GC) | ——— |
| Dolores River | River Bed | Sandy Gravel and Cobbles (GP) | – – – |

# GRADATION CURVES

DAMES & MOORE

SAMPLE NO. – DEPTH – ELEVATION –
SOIL Sandy Gravel and Gravelly Sand (GM-SM)
LOCATION Cut Above St. Louis Adit
OPTIMUM MOISTURE CONTENT 7.5 Percent
MAXIMUM DRY DENSITY 133 Pounds Per Cubic Foot
METHOD OF COMPACTION ASTM D-1557 Method C

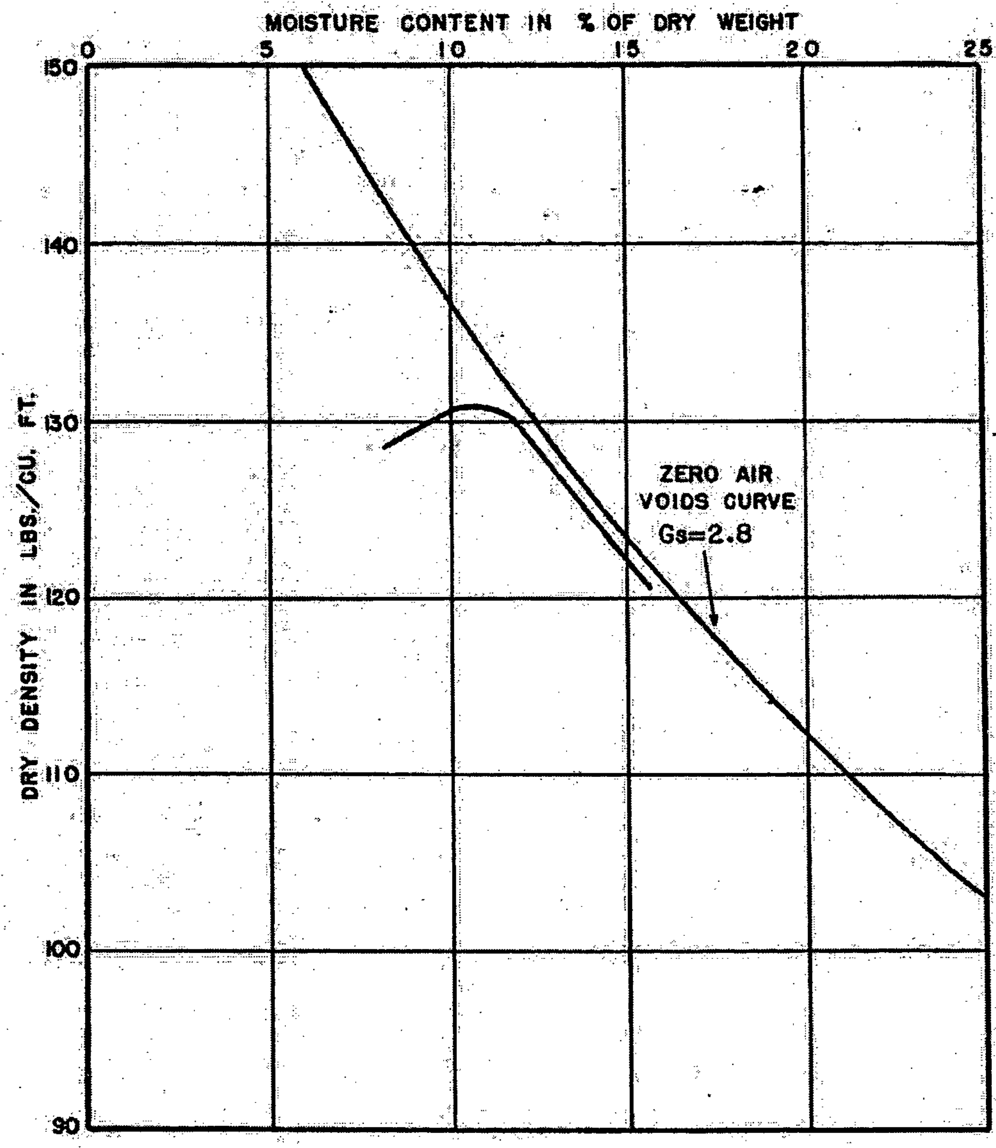


# COMPACTION TEST DATA

DAMES & MOORE

CHECKED BY DATE
REV 2 BY DATE
VISIT BY DATE
04010-082-1605

SAMPLE NO. – DEPTH – ELEVATION –
SOIL Brown Silty Clayey Gravel (GM-GC)
LOCATION Dolores River Bank Material
OPTIMUM MOISTURE CONTENT 11 Percent
MAXIMUM DRY DENSITY 131 Pounds Per Cubic Foot
METHOD OF COMPACTION ASTM D-1557 Method C



# COMPACTION TEST DATA

DAMES & MOORE

CHECKED BY ____ DATE ____
REV BY ____ DATE ____
BY ____ DATE ____
04010-082-1605

# Potential Borrow Sources Geotechnical Properties

## GRADATION
(cumulative percent passing)

Sample ID

| | St. Louis Ponds Site Sources | | | | | Off-Site Sources | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sieve | TP20004A-1 | TP20004A-2 | TP20004B | TP20004C | TP20004D | Line Camp Pit | Hay Camp Pit | Mountain Stone Pit - Top Soil | Mountain Stone Pit - 3/4" |
| 4" | 88 | 82 | 100 | 100 | 100 | 100 | 100 | 100 | 82 |
| 3" | 88 | 80 | 97 | 97 | 100 | 100 | 100 | 100 | 80 |
| 2.5" | 81 | 79 | 94 | 89 | 100 | 100 | 100 | 100 | 79 |
| 2" | 80 | 75 | 92 | 87 | 98 | 100 | 100 | 100 | 75 |
| 1.5" | 73 | 69 | 85 | 82 | 92 | 100 | 100 | 100 | 69 |
| 1" | 63 | 62 | 72 | 76 | 89 | 100 | 100 | 100 | 62 |
| 3/4" | 60 | 58 | 64 | 72 | 85 | 98 | 100 | 100 | 58 |
| 1/2" | 53 | 49 | 53 | 65 | 79 | 96 | 99 | 100 | 49 |
| 3/8" | 49 | 46 | 46 | 60 | 77 | 95 | 99 | 100 | 46 |
| #4 | 41 | 38 | 36 | 54 | 68 | 90 | 99 | 99 | 38 |
| #8 | 34 | 30 | 29 | 46 | 62 | 87 | 98 | 98 | 30 |
| #16 | 28 | 24 | 25 | 42 | 56 | 85 | 98 | 95 | 24 |
| #30 | 23 | 20 | 22 | 36 | 50 | 80 | 97 | 92 | 20 |
| #40 | 21 | 17 | 21 | 32 | 46 | 76 | 96 | 91 | 17 |
| #50 | 18 | 15 | 18 | 29 | 40 | 68 | 95 | 88 | 15 |
| #100 | 14 | 12 | 14 | 24 | 28 | 47 | 93 | 75 | 12 |
| #200 | 13 | 10 | 12 | 22 | 24 | 36 | 85 | 65 | 10 |

## ATTERBERG LIMITS

| Index Value (%) | TP20004A-1 | TP20004A-2 | TP20004B | TP20004C | TP20004D | Line Camp Pit | Hay Camp Pit | Mountain Stone Pit - Top Soil | Mountain Stone Pit - 3/4" |
|---|---|---|---|---|---|---|---|---|---|
| Liquid limit | 26 | 28 | 31 | 26 | 21 | 21 | 28 | 29 | no LL |
| Plastic Limit | 18 | 18 | 20 | 18 | 17 | 18 | 20 | 19 | no PL |
| Plasticity Index | 8 | 8 | 11 | 8 | 4 | 3 | 8 | 10 | non plastic |
| Moisture Content | 14.9 | 12.4 | 13.8 | 11.8 | 9.2 | 14.9 | 4.1 | 12.1 | 4.7 |

# POTENTIAL BORROW SOURCES AGRONOMIC PROPERTIES

| | Agronomic Data | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Saturated Paste Extract | | | | | | | | | | |
| Sample ID | EC as mmho/cm | N -ppm as N03 | Bicarb P -ppm as P | Bray Weak P -ppm as P | K -ppm as K | pH as units | Organic Matter as % | CEC meq/100 | Saturation Percent | Mg Meq/L | Ca Meq/L | Na Meq/L | SAR | Mg as ppm | Ca as ppm | CaCO3 as % | T - S as % | Neutralization Potential Tn/1000Tn | Acid Potential Tn/1000Tn | Acid-Base Potential Tn/1000Tn |
| **St. Louis Ponds Site Sources** | | | | | | | | | | | | | | | | | | | | |
| TP2004 4A-a | | 1 | 2 | | 78 | 6.9 | 1.2 | 17.1 | | | | | | 232 | 2992 | 0.825 | 0.197 | 8.25 | 6.15 | 2.10 |
| TP2004 4A-b | | 1 | 4 | | 70 | 7.5 | 1.0 | 13.4 | | | | | | 191 | 2332 | 1.08 | 0.041 | 10.80 | 1.28 | 9.53 |
| TP2004 4B | | 1 | 1 | | 54 | 8.1 | 0.6 | 16.0 | | | | | | 190 | 2851 | 3.286 | 0.036 | 32.90 | 1.13 | 31.70 |
| TP2004 4C | | 1 | 2 | | 72 | 7.8 | 1.0 | 10.8 | | | | | | 94 | 1957 | 0.365 | 0.015 | 3.65 | 0.48 | 3.16 |
| TP2004 4D | | 2 | 1 | | 69 | 7.9 | 1.3 | 11.0 | | | | | | 89 | 2023 | 2.212 | 0.048 | 22.10 | 1.50 | 20.60 |
| **Off-Site Sources** | | | | | | | | | | | | | | | | | | | | |
| Line Camp Pit - Top Soil | | 8 | 1 | | 68 | 7.7 | 1.3 | 8.0 | | | | | | 117 | 1378 | 1.541 | 0.068 | 15.40 | 2.14 | 13.30 |
| Line Camp Pit (earlier sample) | | | | | 151 | 7.6 | 2.1 | 10.7 | | | | | | 187 | 1752 | | | | | |
| Hay Camp Pit | 0.34 | 6 | | 26 | 304 | 6.7 | 2.4 | 14.2 | 43.7 | 0.72 | 2.41 | 0.57 | 0.45 | 314 | 2152 | 0.117 | 0.021 | 1.17 | 0.66 | 0.51 |
| Hay Camp Pit (earlier sample) | | | | | 270 | 7.1 | 3.3 | 12.3 | | | | | | 246 | 1910 | | | | | |
| Mountain Stone Pit - Top Soil | 1.76 | 91 | 5 | | 111 | 7.5 | 1.9 | 16.1 | 49.3 | 3.85 | 13.8 | 1.38 | 0.47 | 253 | 2740 | 1.336 | 0.019 | 13.4 | 0.59 | 12.8 |
| Mountain Stone Pit - 3/4" | 0.31 | 1 | 3 | | 72 | 8.3 | 0.5 | 9.2 | 23.5 | 0.48 | 2.25 | 0.95 | 0.82 | 78 | 1670 | 1.847 | 0.038 | 18.5 | 1.18 | 17.3 |

| | USDA Textural Data (see note) | | | | | Total Soil Metals Data (Nitric Acid Digest) | | | | | | | | Plant Available Soil Metals Data (Bicarb DTPA) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (mg/kg) | | | | | | | | (mg/kg) | | | | |
| Sample ID | Percent Sand | Percent Silt | Percent Clay | USDA Class | Percent Course Fragments | B | Cd | Cu | Fe | Pb | Mn | Mo | Zn | B | Cu | Fe | Mn | Zn |
| **St. Louis Ponds Site Sources** | | | | | | | | | | | | | | | | | | |
| TP2004 4A-a | 68.8 | 18.8 | 12.5 | silty loam | 36.0 | 49.4 | 8.4 | 48.4 | 22100 | 187 | 1250 | <1.0 | 230 | | | | | |
| TP2004 4A-b | 70.0 | 16.3 | 13.8 | silty loam | 36.0 | 46.9 | 7.6 | 38.6 | 21200 | 60.1 | 1110 | <1.0 | 161 | | | | | |
| TP2004 4B | 63.8 | 18.8 | 17.5 | silty loam | 47.0 | 64 | 11.8 | 47.0 | 30800 | 116 | 1720 | 3.2 | 240 | | | | | |
| TP2004 4C | 65.0 | 18.8 | 16.3 | silty loam | 13.0 | 20.1 | 2.8 | 15.5 | 7780 | 23.5 | 353 | <1.0 | 45.4 | | | | | |
| TP2004 4D | 66.3 | 18.8 | 15.0 | silty loam | 22.5 | 43.4 | 7.0 | 54.7 | 17500 | 328 | 837 | 4.3 | 246 | | | | | |
| **Off-Site Sources** | | | | | | | | | | | | | | | | | | |
| Line Camp Pit - Top Soil | 60.0 | 21.3 | 18.8 | silty loam | 31.0 | 65.3 | 15.4 | 117 | 30800 | 613 | 2130 | 3.6 | 920 | | | | | |
| Line Camp Pit (earlier sample) | | | | | | | | | | | | | | 0.6 | 2 | 41 | 11 | 3.2 |
| Hay Camp Pit | 46.3 | 31.3 | 22.5 | loam | <2.0 | NT | 3.4 | NT | NT | 12 | NT | <1.0 | NT | | | | | |
| Hay Camp Pit (earlier sample) | | | | | | | | | | | | | | 0.7 | 1.5 | 38 | 17 | 2.3 |
| Mountain Stone Pit - Top Soil | 46.3 | 32.5 | 21.3 | loam | 0.0 | 29.1 | 2.7 | 14.8 | 7970 | 12.5 | 384 | <1.0 | 46.1 | | | | | |
| Mountain Stone Pit - 3/4" | 87.5 | 8.8 | 3.8 | loamy Sand | 80.4 | 31.8 | 3.5 | 160 | 11100 | 15.8 | 459 | <1.0 | 136 | | | | | |

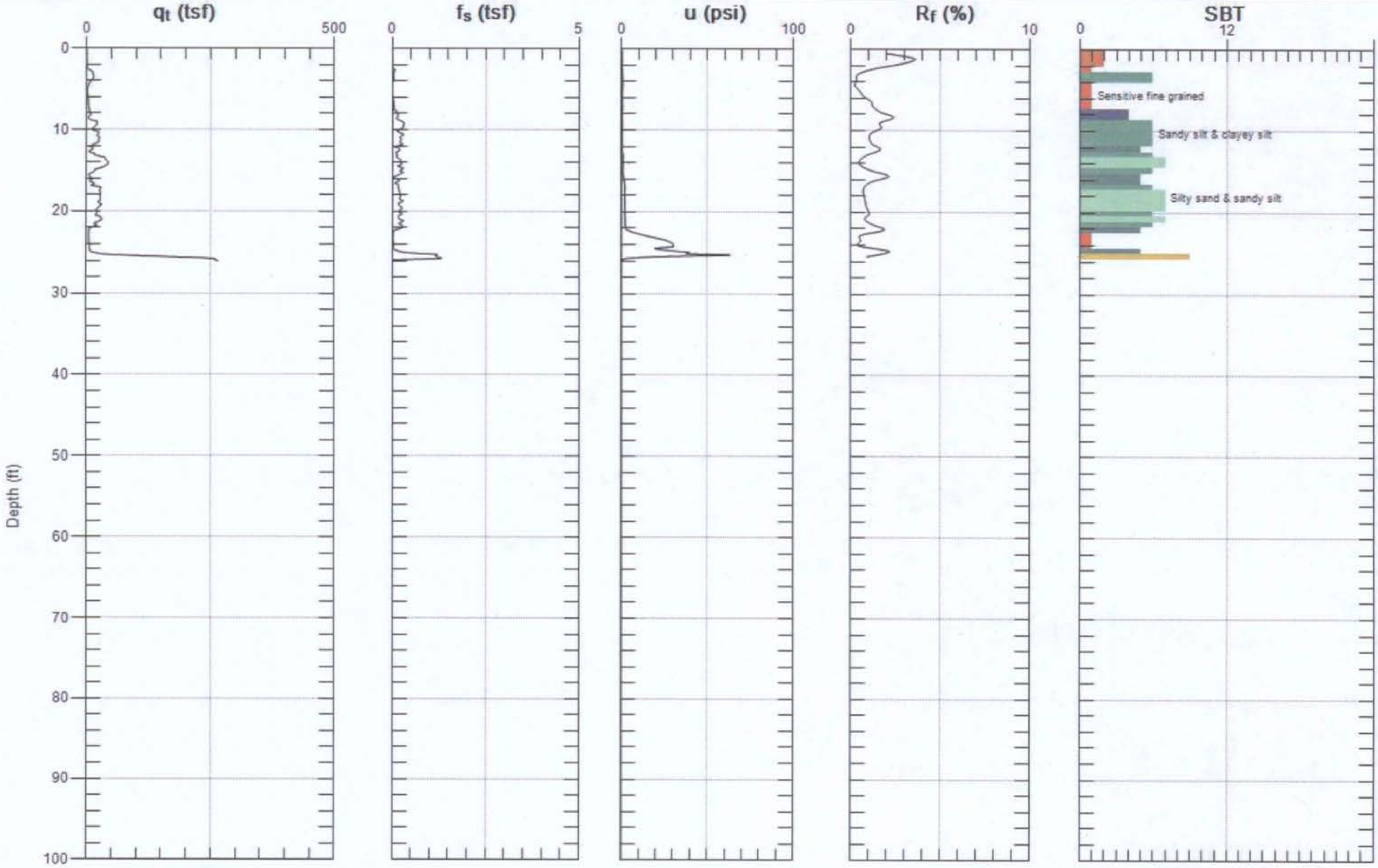
Note: USDA Textural Data was determined on samples that had been screened to remove material over 3/4"

# APPENDIX A3
# CPT LOGS

**AECI**

**Site: RICO ST LUIS DRYING CE** **Engineer: C. SANCHEZ**

**Sounding: CPT-01** **Date: 10/31/2011 03:51**



Max. Depth: 26.083 (ft)
Avg. Interval: 0.656 (ft)

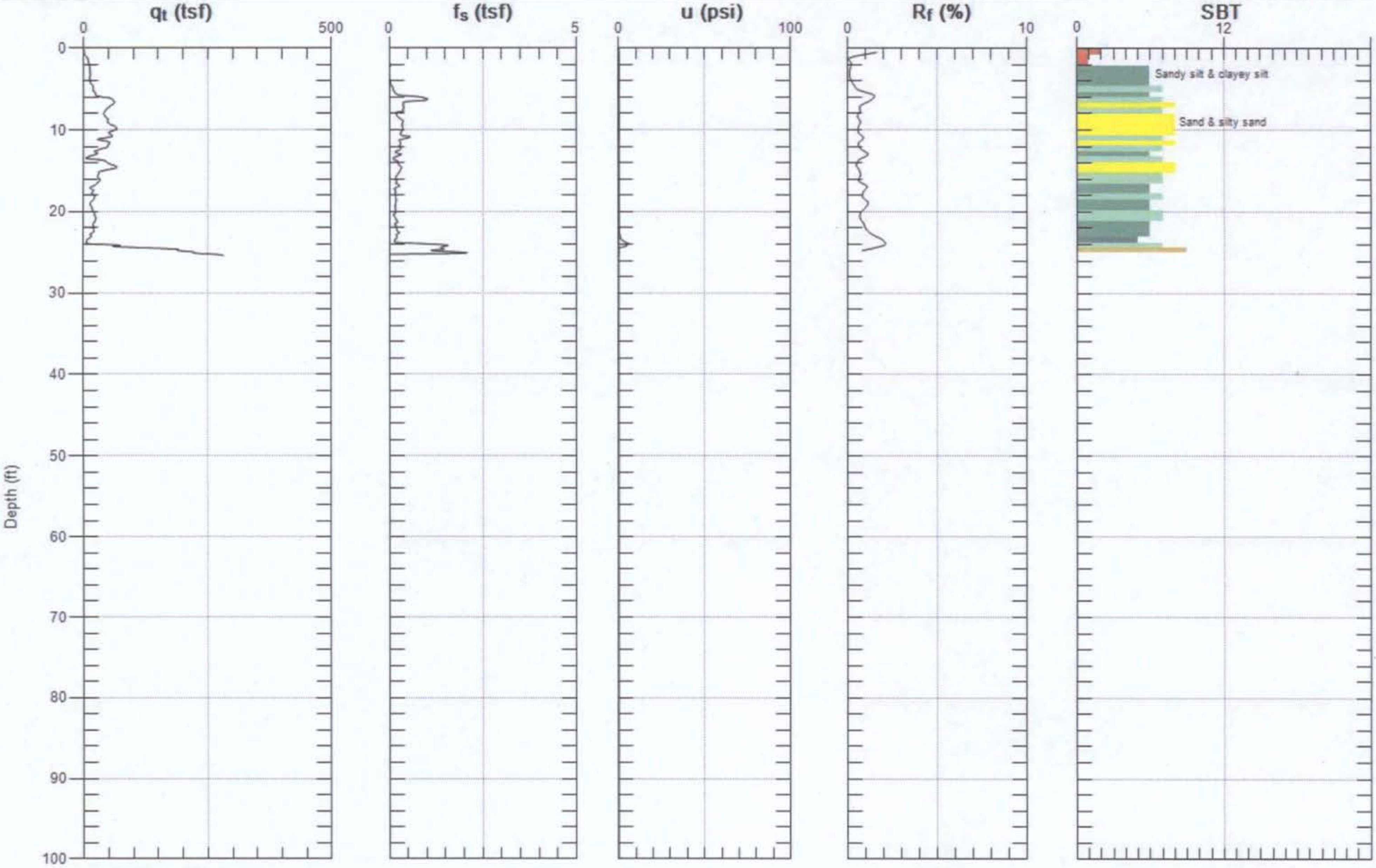
SBT: Soil Behavior Type (Robertson 1990)

GREGG

**AECI**

**Site: RICO ST LUIS DRYING CELLS** **Engineer: C. SANCHEZ**

**Sounding: CPT-02** **Date: 10/31/2011 02:50**



Max. Depth: 25.427 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

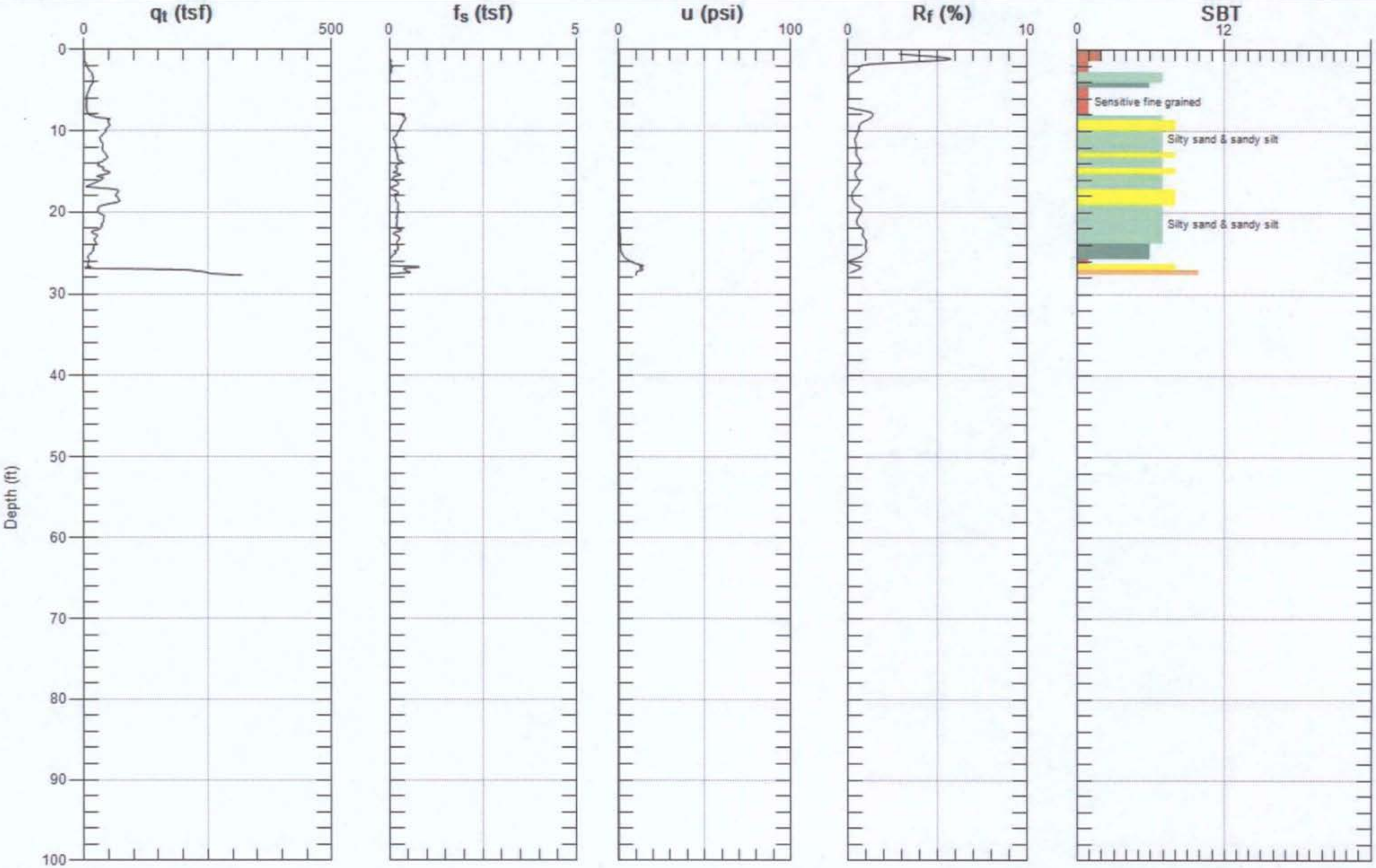
GREGG

**AECI**

**Site: RICO ST LUIS DRYING CEEngineer: C. SANCHEZ**

**Sounding: CPT-03**

**Date: 10/31/2011 03:24**



Max. Depth: 27.723 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**GREGG** **AECI**

**Site: RICO ST LUIS DRYING CEEL9** **Engineer: C. SANCHEZ**

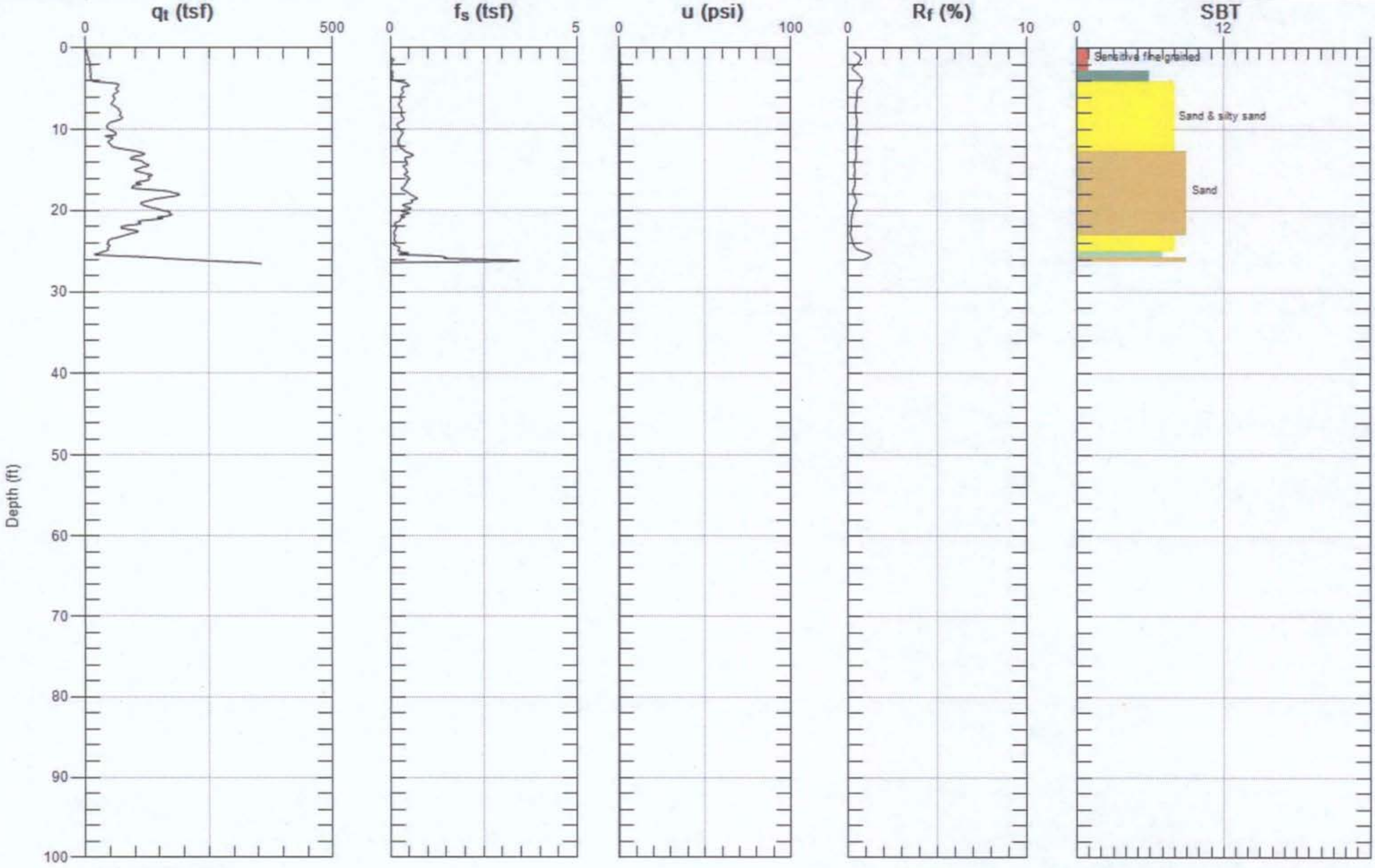
**Sounding: CPT-04** **Date: 11/1/2011 08:03**

Max. Depth: 18.209 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CE**
**Engineer: C. SANCHEZ**
**Sounding: CPT-05**
**Date: 11/1/2011 07:42**



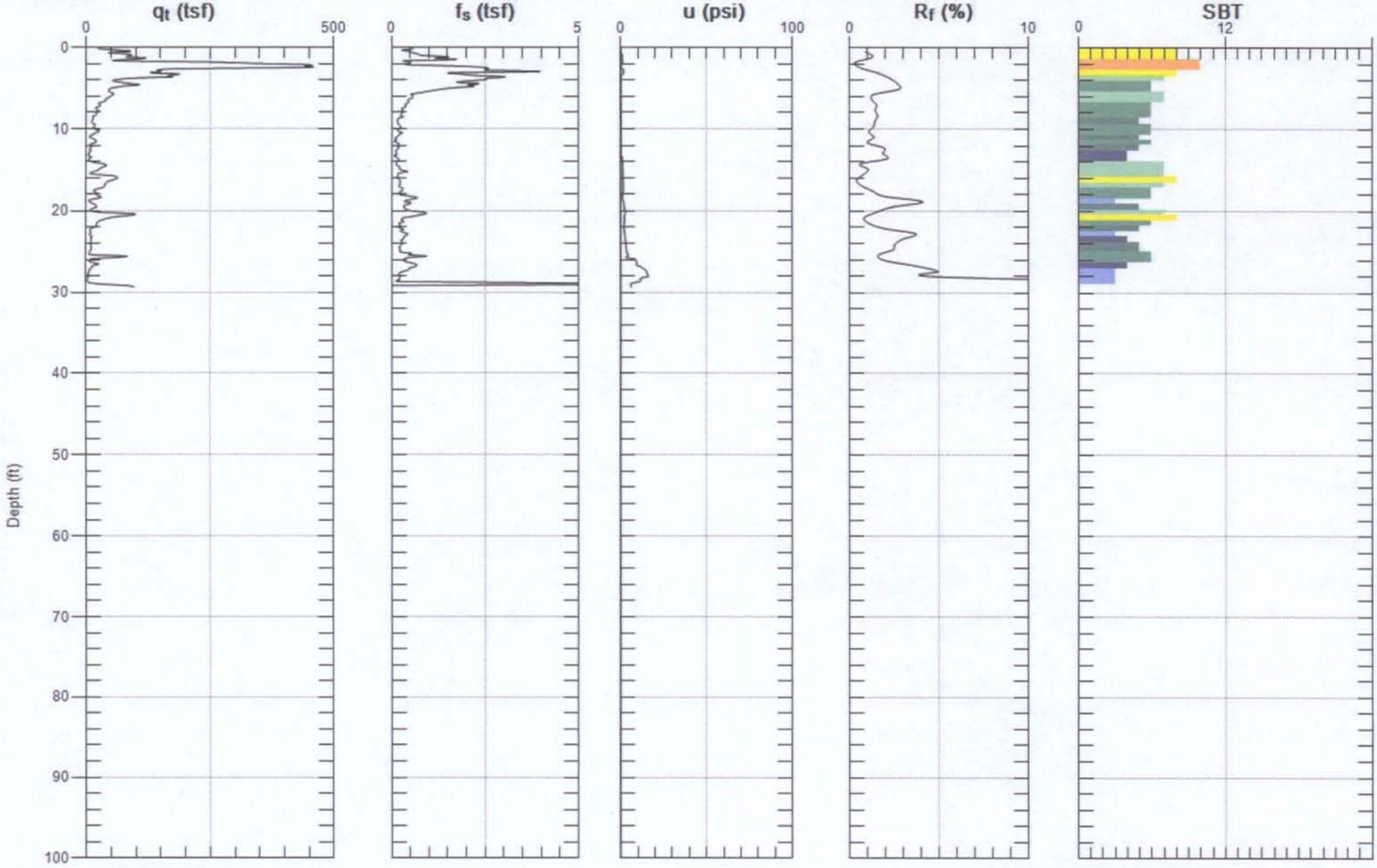
Max. Depth: 26.575 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CE** **Engineer: C. SANCHEZ**

**Sounding: CPT-06** **Date: 10/31/2011 01:31**



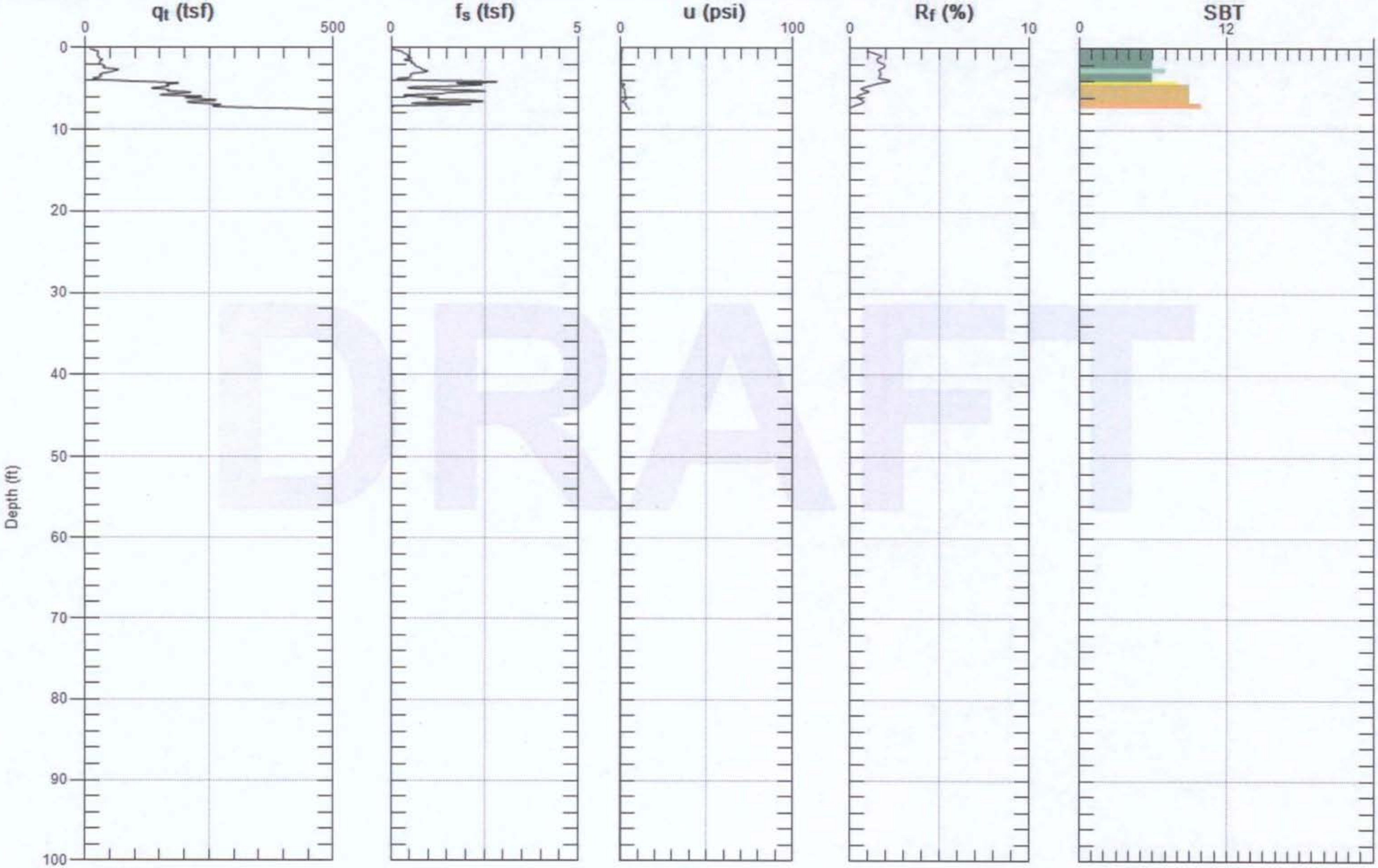
Max. Depth: 29.364 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CELL 8** **Engineer: C. SANCHEZ**

**Sounding: CPT-07** **Date: 11/2/2011 12:35**



Max. Depth: 7.546 (ft)
Avg. Interval: 0.328 (ft)

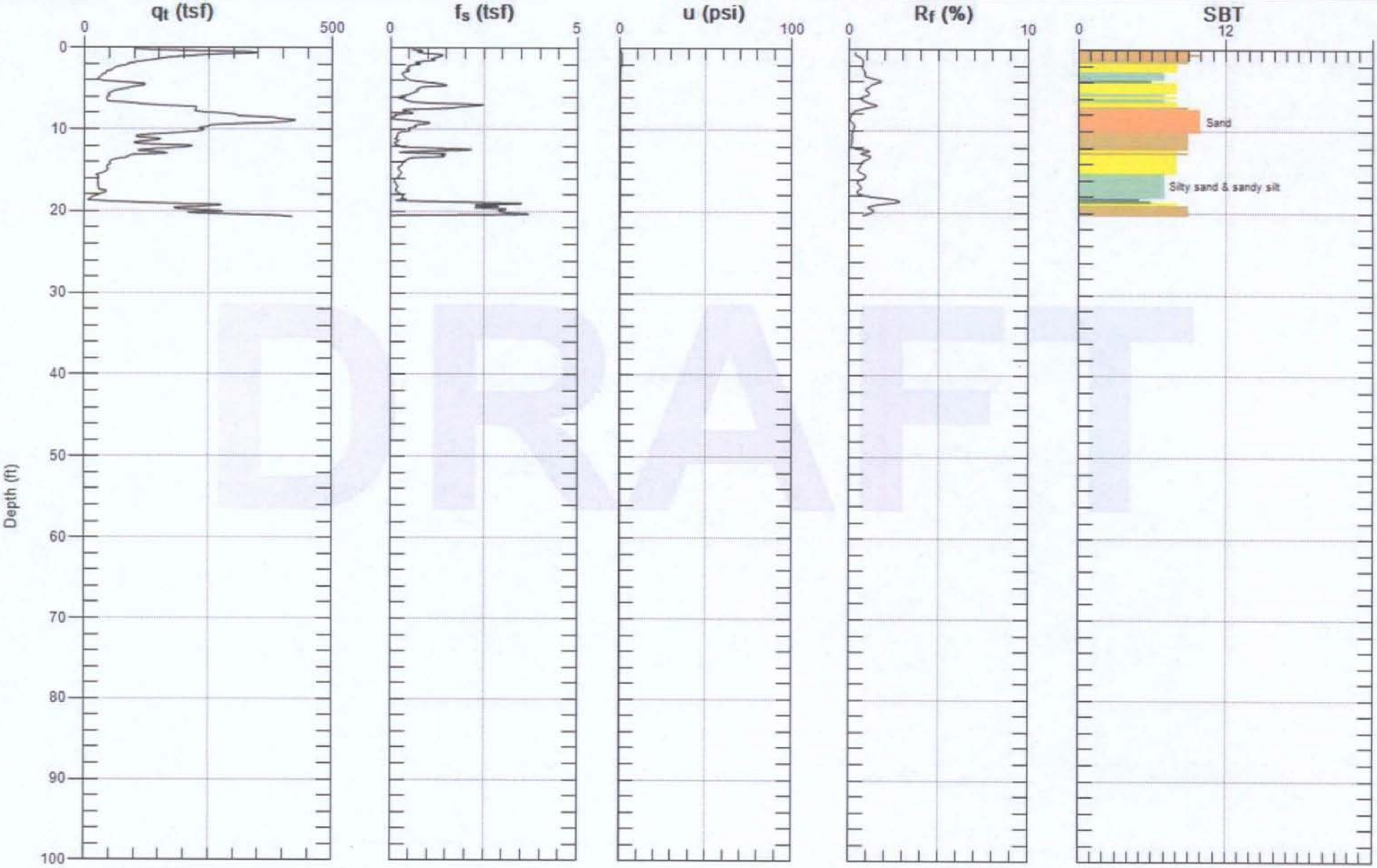
SBT: Soil Behavior Type (Robertson 1990)

GREGG

**AECI**

**Site: RICO ST LUIS DRYING CE** **Engineer: C. SANCHEZ**

**Sounding: CPT-ADFR-01** **Date: 11/1/2011 01:59**



Max. Depth: 20.669 (ft)
Avg. Interval: 0.328 (ft)

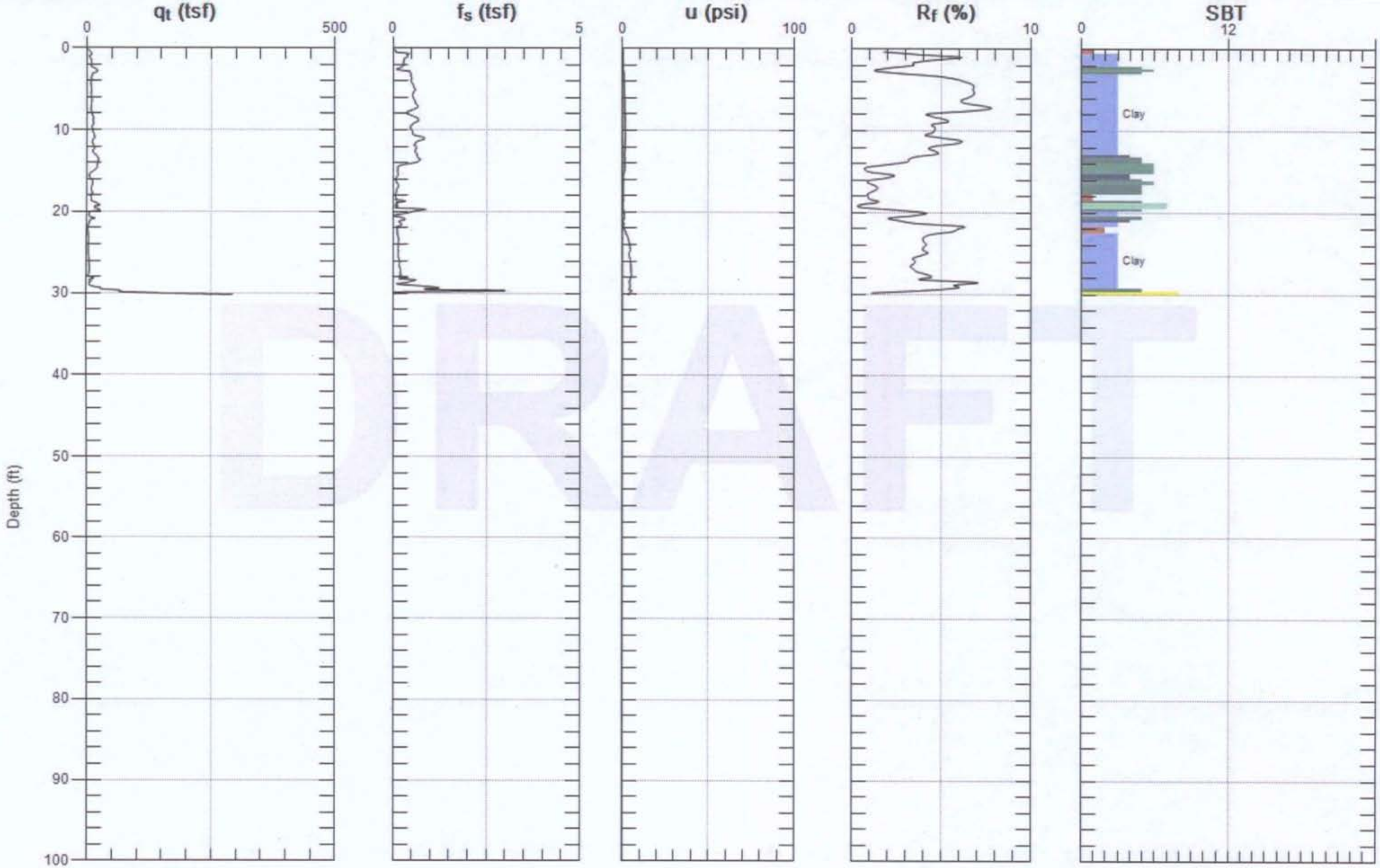
SBT: Soil Behavior Type (Robertson 1990)

GREGG

**AECI**

**Site: RICO ST LUIS DRYING CE** **Engineer: C. SANCHEZ**

**Sounding: CPT-ADFR-01A** **Date: 11/1/2011 02:32**



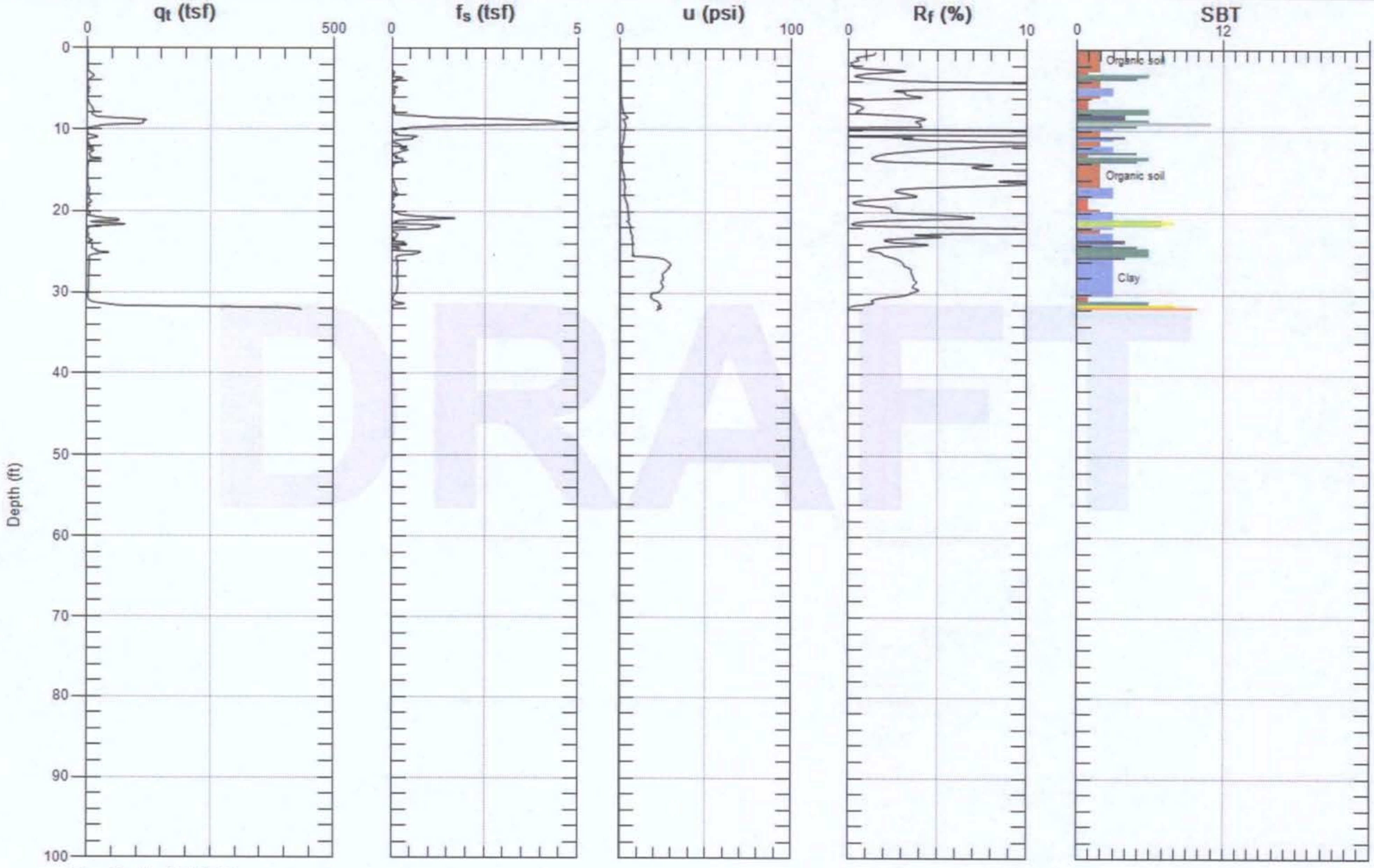
Max. Depth: 30.184 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CELL 8** **Engineer: C. SANCHEZ**

**Sounding: CPT-ADFR-02** **Date: 11/1/2011 12:53**



Max. Depth: 32.152 (ft)
Avg. Interval: 0.328 (ft)

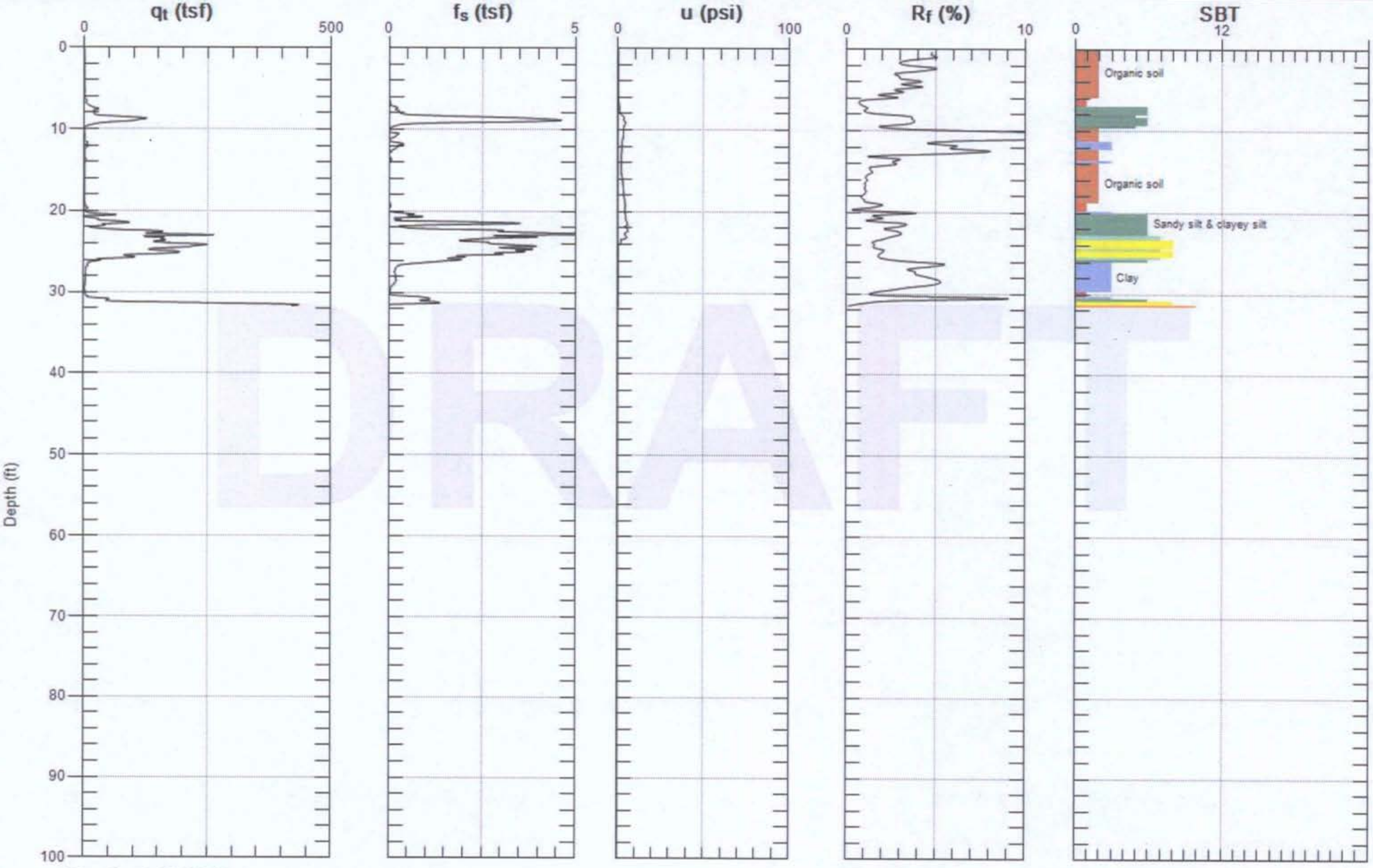
SBT: Soil Behavior Type (Robertson 1990)

GREGG

**AECI**

**Site: RICO ST LUIS DRYING CELL 8** **Engineer: C. SANCHEZ**

**Sounding: CPT-ADFR-02A** **Date: 11/1/2011 01:28**



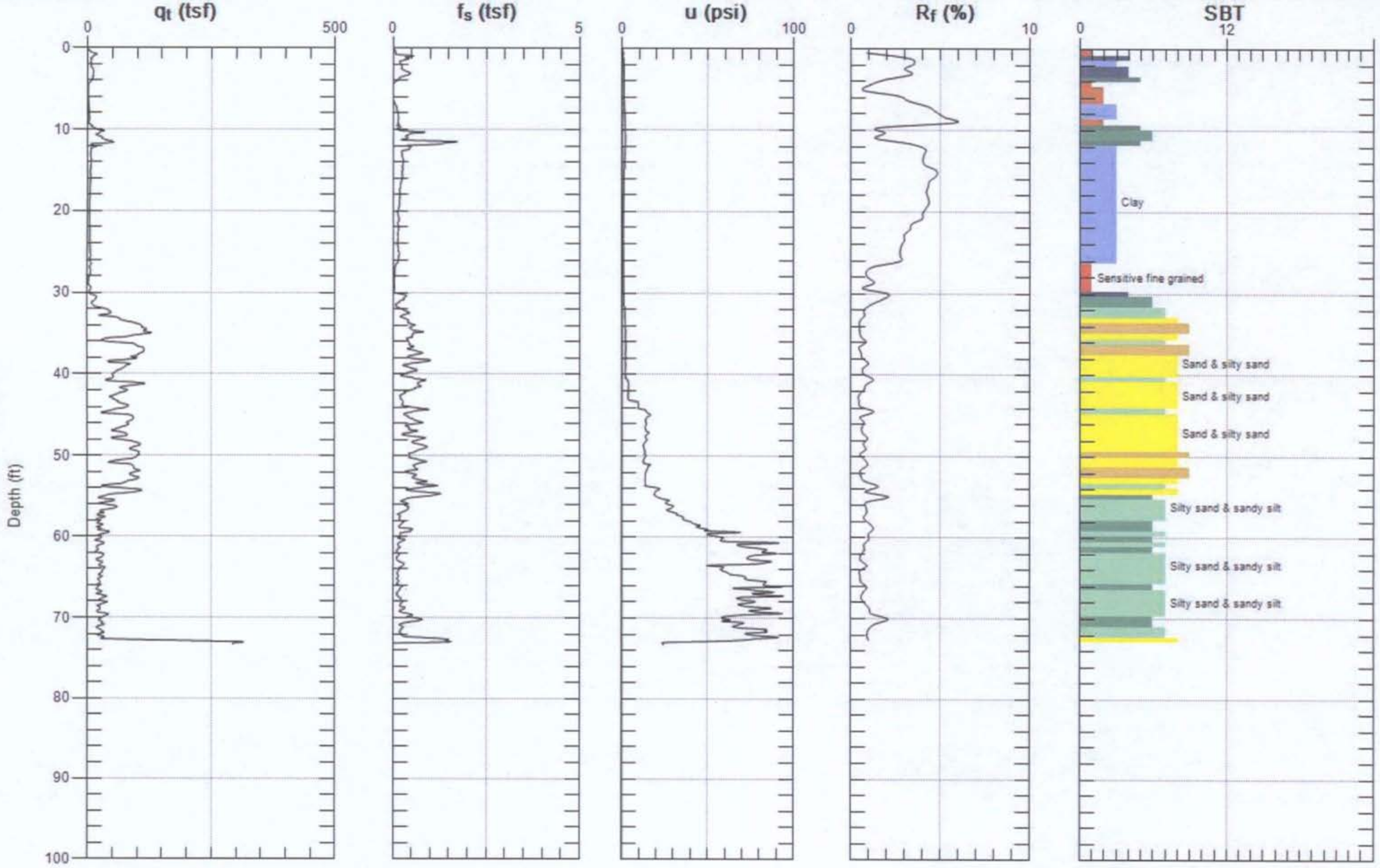
Max. Depth: 31.660 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CELL 8** **Engineer: C. SANCHEZ**

**Sounding: CPT-ED-02** **Date: 11/1/2011 09:59**



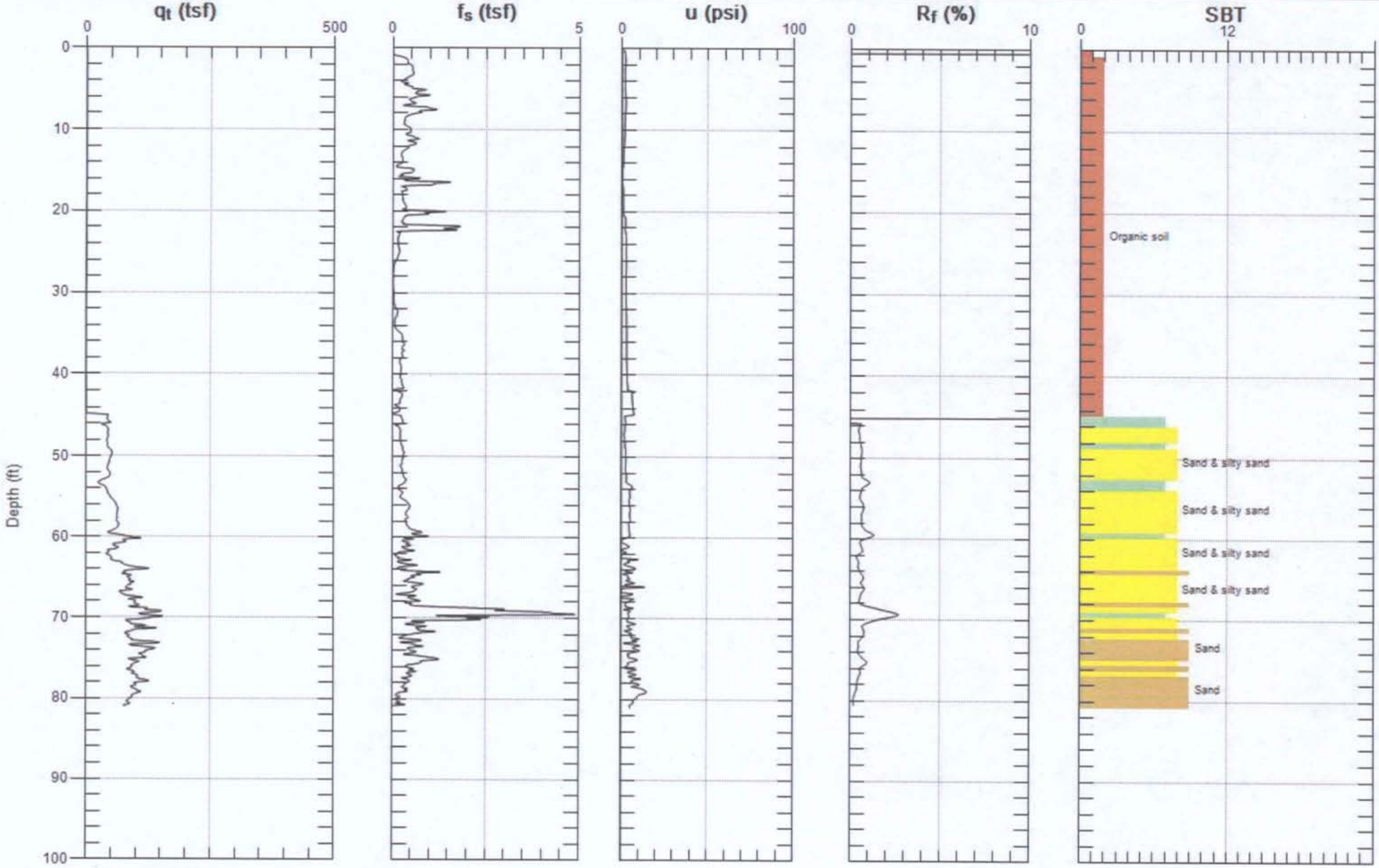
Max. Depth: 73.327 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CELL8** **Engineer: C. SANCHEZ**

**Sounding: CPT-ED-04** **Date: 11/1/2011 08:39**



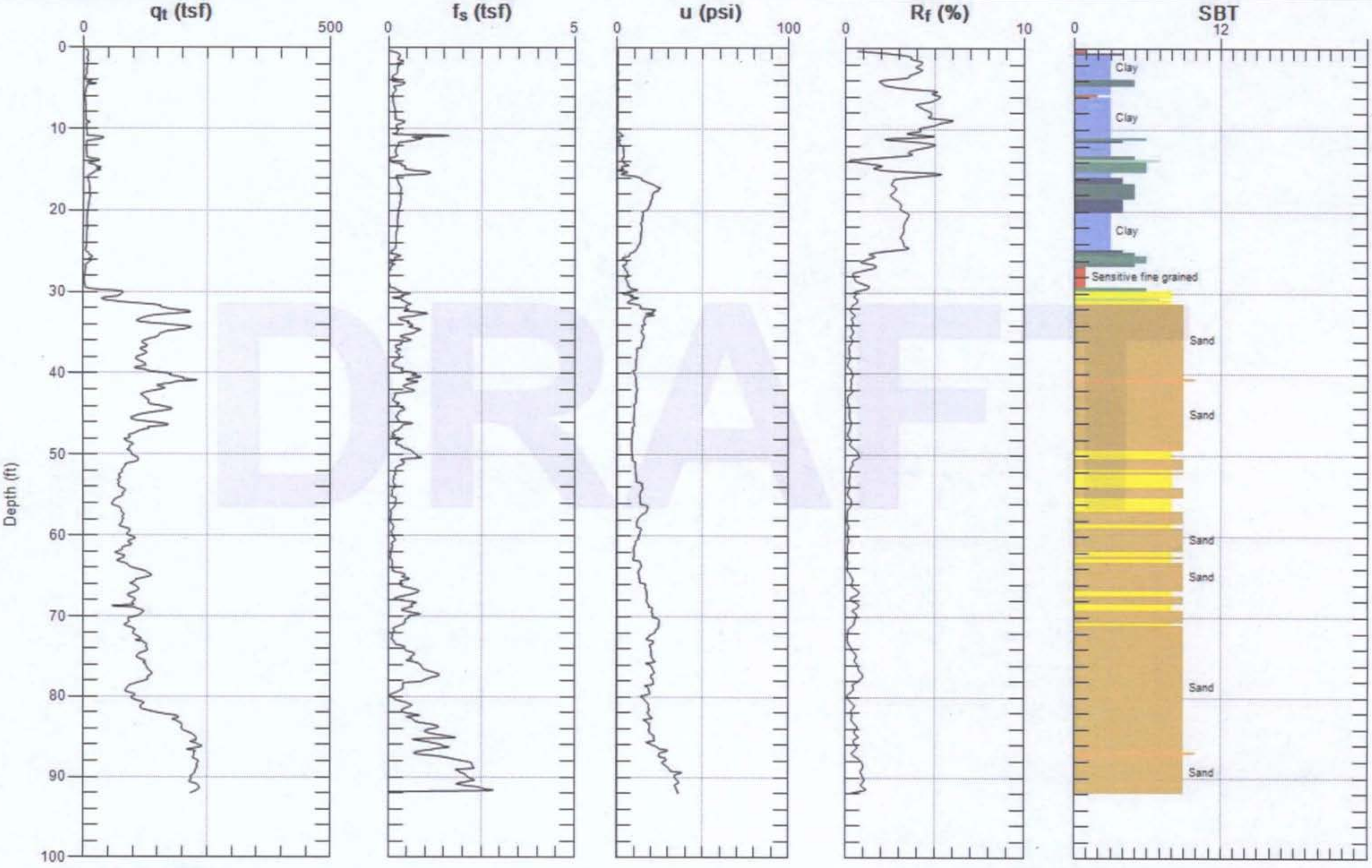
Max. Depth: 81.037 (ft)
Avg. Interval: 0.656 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**GREGG** **AECI**

**Site: RICO ST LUIS DRYING CEELLS** **Engineer: C. SANCHEZ**

**Sounding: CPT-ED-05** **Date: 11/2/2011 10:03**



Max. Depth: 92.028 (ft)
Avg. Interval: 0.328 (ft)

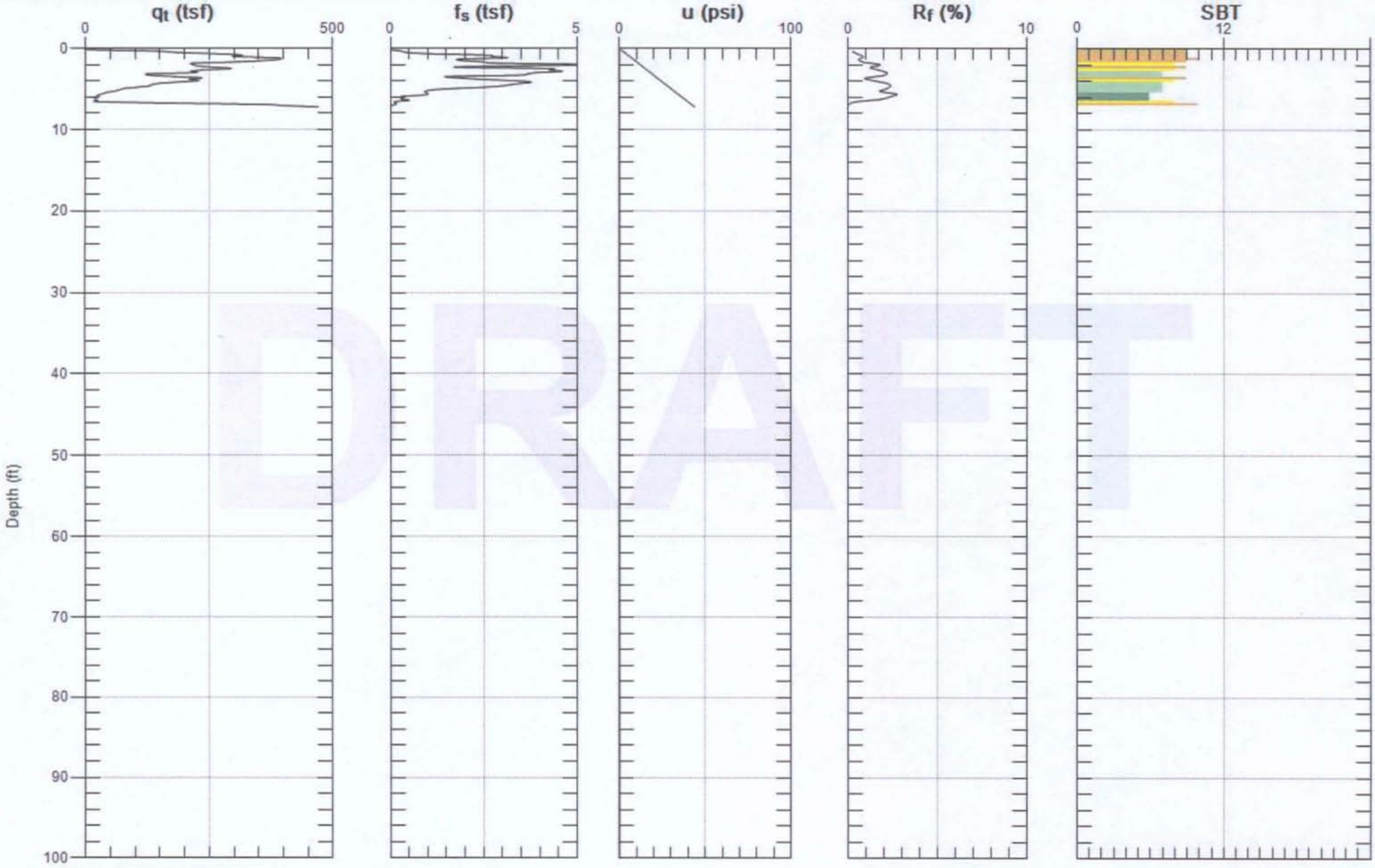
SBT: Soil Behavior Type (Robertson 1990)

GREGG

**AECI**

**Site: RICO ST LUIS DRYING CE** **Engineer: C. SANCHEZ**

**Sounding: CPT-NSR-02** **Date: 11/1/2011 03:00**



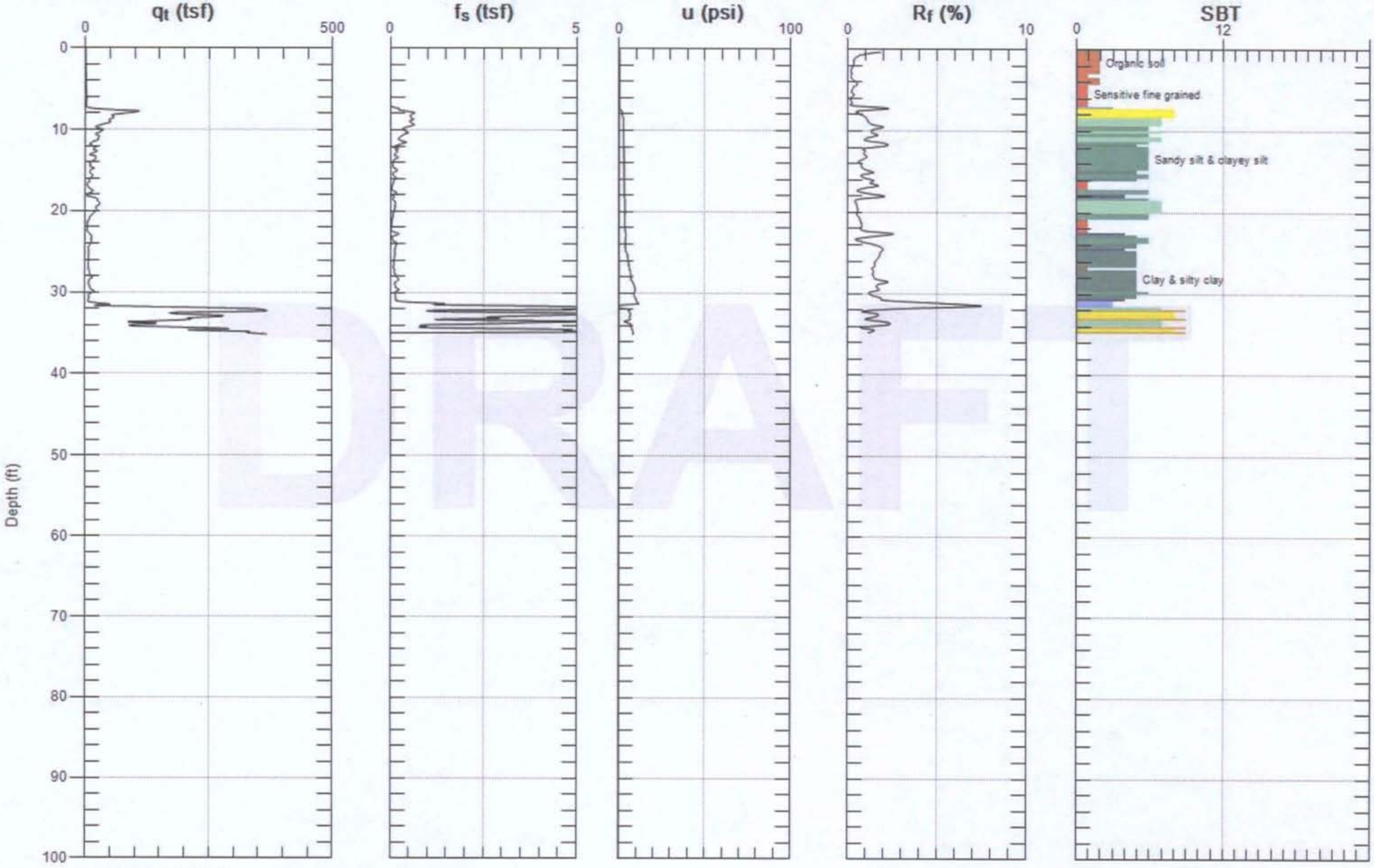
Max. Depth: 7.218 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**GREGG** **AECI**

**Site: RICO ST LUIS DRYING CELL** **Engineer: C. SANCHEZ**

**Sounding: CPT-PDF-03** **Date: 11/2/2011 08:41**

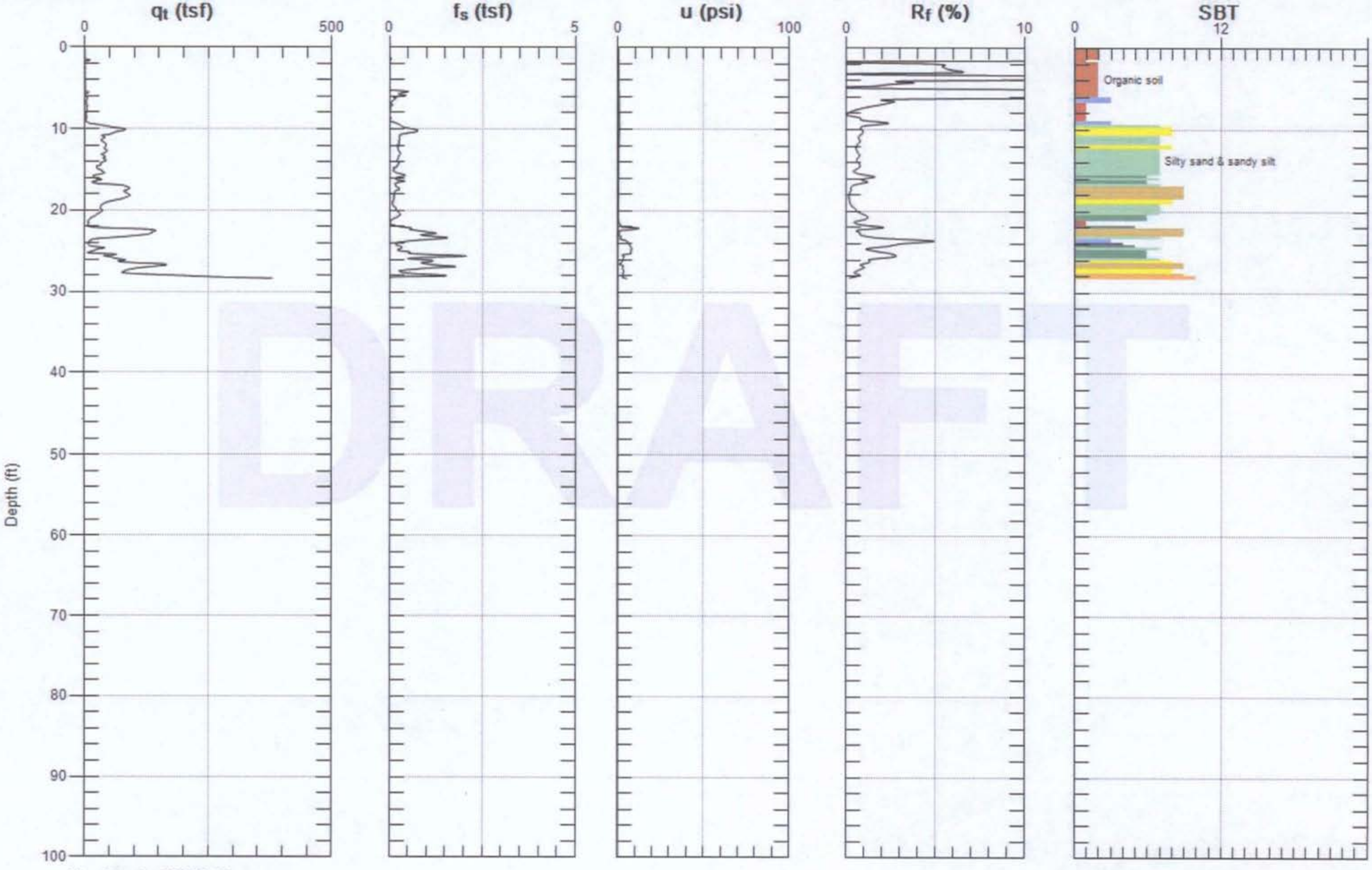


Max. Depth: 35.105 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

**AECI**

**Site: RICO ST LUIS DRYING CEEngineer: C. SANCHEZ**
**Sounding: CPT-SSR-05**
**Date: 11/1/2011 03:37**

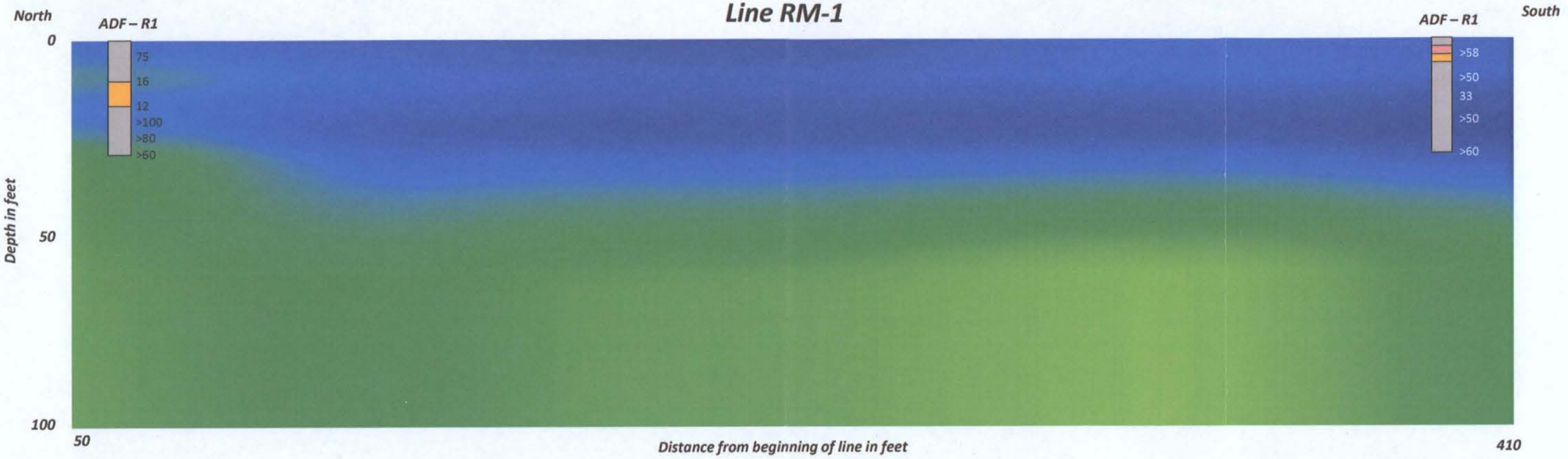


Max. Depth: 28.379 (ft)
Avg. Interval: 0.328 (ft)

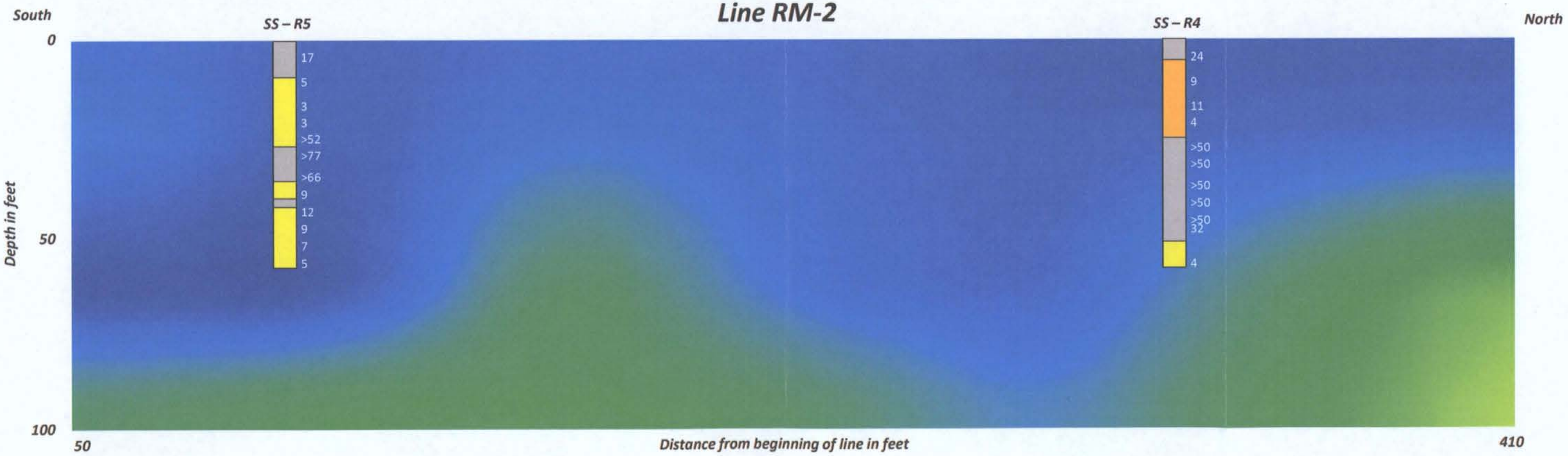
SBT: Soil Behavior Type (Robertson 1990)

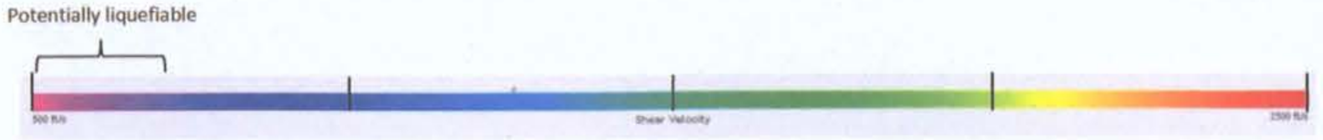
# APPENDIX A4
# REFRACTION MICROTREMOR (ReMi) PROFILES

## Line RM-1

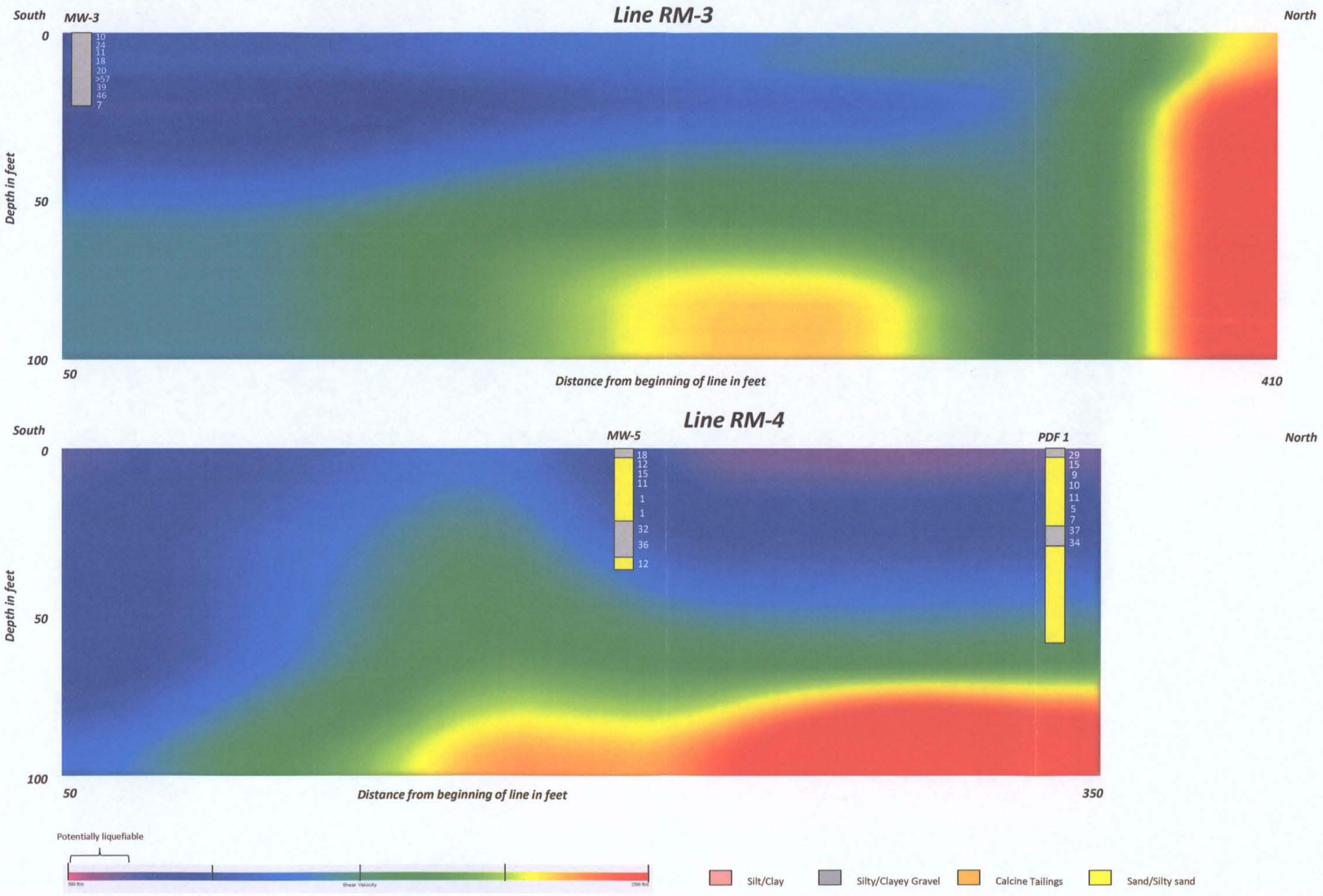


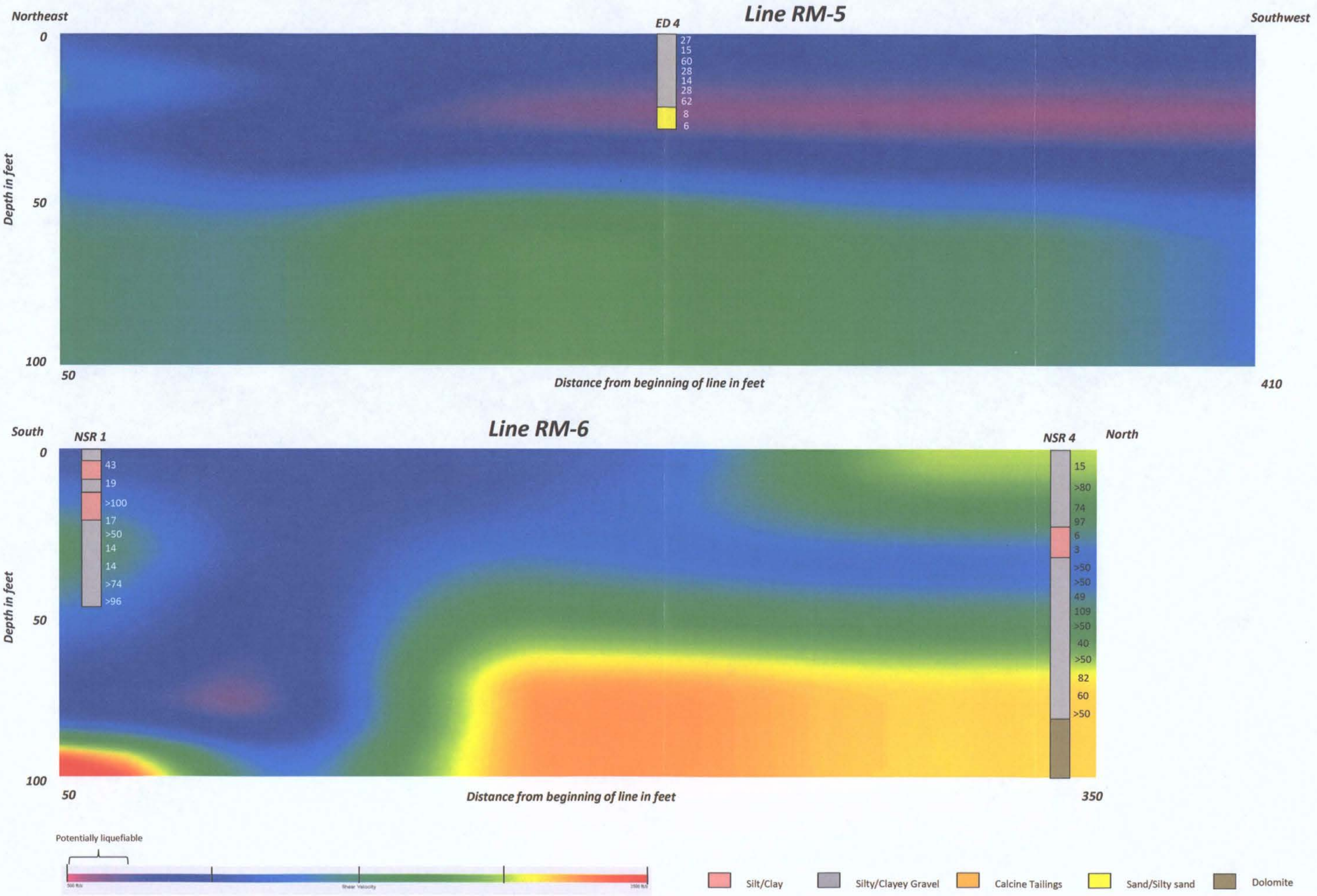
## Line RM-2





🟥 Silt/Clay
⬜ Silty/Clayey Gravel
🟧 Calcine Tailings
🟨 Sand/Silty sand


Line RM-3
South
MW-3
North
0
50
100
Depth in feet
10
24
11
18
20
>57
39
46
7
50
Distance from beginning of line in feet
410
Line RM-4
South
MW-5
PDF 1
North
0
50
100
Depth in feet
18
12
15
11
1
1
32
36
12
29
15
9
10
11
5
7
37
34
50
Distance from beginning of line in feet
350
Potentially liquefiable
500 ft/s
Shear Velocity
1500 ft/s
Silt/Clay
Silty/Clayey Gravel
Calcine Tailings
Sand/Silty sand



Line RM-5

Line RM-6

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# 1.0 Purpose of Flood Dike Assessment

This Section of the report describes the data collected and analyses performed to support the assessment of the scour potential of the Rico flood dikes. In general, the analyses consisted of: 1) the development of the 100-year flood hydrology; 2) the hydraulic analysis of the Dolores River at the Rico site using the 100-year flood flow; and 3) evaluation of the existing riprap slope protection based on the inundation area and velocities determined by the hydraulic model.

# 2.0 Data Collection

## 2.1 Site Visit

AECOM staff performed a site visit to assess the condition of the flood dike and the riprap on the dike and gather information for the analyses. The information gathered consisted of photo and video documentation and test pit samples.

Prior to arriving on site, river stationing was established and survey stakes were placed at 100-foot intervals along the left (east) river bank. A general assessment was performed by walking the length of the flood dike to determine the locations to document representative riprap condition and dig test pits. During the general assessment, the flood dike and riprap cover were categorized into six representative reaches. To record the stations and locations of the flood dike, continuous photo coverage was taken along the six reaches described below. Representative photos for each station segment documented are included in Photo 2.1 through Photo 2.73. A list of the photos and video taken for the reaches is included in the Field Data Log in Appendix B1.

A system of collecting riprap data was developed by providing a surficial stone count within a six-foot by six-foot grid, constructed of PVC pipe and placed on the slope at the established locations. Visible surface materials were divided into five categories; 1) fines, 2) 1/3-inch to 3 inches; 3) 3 inches to one foot; 4) one foot to two feet, and 3) over two feet. This information is included in Appendix B2. At the time of the field survey, the 100-year water surface elevation was unknown. For this reason, some grid data was obtained where significant freeboard exists above the riprap. These locations were identified with an 'A' designation to correspond with the 'B' designation of the riprap grid, referring to a grid lower on the slope. Slope data was also collected at each grid location. A summary of the grid data collected is included in the Field Data Log in Appendix B1.

To gather information on the riprap bedding, test pits were excavated and documented. Fifteen test pits were completed, most using a 'mini-excavator'. The mini-excavator was not available the first day of the site visit, so the initial test pit (TP2011-FD7) was dug by hand. Samples were taken from several test pit locations for gradation testing to determine the filter compatibility. The analysis and lab results are presented in Section 5.0. The test pit locations and the video log documentation are summarized in the Field Data Log in Appendix B1. Figure 2.1 shows the Stationing and the Grid and Test Pit locations.

## 2.2 Past Studies and Information

In addition to the data obtained in the field, past reports and information on riprap design and construction were reviewed. The reports are summarized in chronological order below:

- *June 11, 1981 – Water Quality Application (Anaconda, 1981a).* This memorandum describes riprap stabilization along 2,600 feet of the east bank of the Dolores River including 1,200 cy of riprap bedding and 3,500 cy of riprap. Based on the drawings included with the memorandum, the riprap has a $D_{50}$ of 15-inches and is 24 inches thick on top of eight (8) inches of riprap bedding. A plan view shows riprap extending from the south end of Pond 5 to the north end of Pond 18.

- *August 26, 1981 – Addendum No. 1 (Dames and Moore, 1981b).* This addendum provides a description of the pre-bid site visit and answers to questions raised during the visit. The original bid documents were not located.

- *August 27, 1981 – Addendum No. 2 (Dames and Moore, 1981c).* This addendum is a revision for the riprap gradation from $D_{50}$ = 15 inches to $D_{50}$ = 18 inches. It also states a bid date of 9/4/81 with an award date of 9/14/81.

- *October 6, 1981 – Application to COE (Anaconda, 1981b).* This application is for extension of riprap along the settling ponds. The ponds were to be extended by approximately 900 LF. Estimated volumes are 1,100 cy and 300 cy of riprap and bedding, respectively. Accompanying figures (3) dated September 25, 1981 show the riprap extending half way up Pond 18 to north of the 'Leachate Basin'. The figures in the report show the area map, plan, and section.

- *November 13, 1981 – Memorandum describing construction observation and Quality Assurance of the Stabilization project (Dames and Moore, 1981d).* Issues noted included:
  - the 100 year flood level was higher than calculated due to road construction so the bank was raised "a foot (or so)" to accommodate;
  - crushing operations produced too much silty fines and it was recommended that the material be "screened and/or cleaned to meet the specifications";
  - a density test indicated that the riprap specific gravity (S.G.) was less than specified and recommended increasing the $D_{50}$ from a range of 15 to 18 inches to a range of 18 to 21 inches. "This was done in most areas";
  - rock delivered prior to the week of October 12, 1981 included "unsatisfactory slab type". It was recommended that these be placed only in the top one-foot of the freeboard area;
  - riprap at the toe settled some "due to a somewhat compressible foundation……and equipment travel." Larger size riprap was placed continuously along the toe in two critical areas;
  - A few areas at the north end of the bank stabilization were irregular in placement and contained some minor voids with a lack of smaller rocks;
  - vegetation may require reseeding;
  - the access road along the bank was not filled in and graded as designed for about 200 to 300 feet on the north end of the stabilization;
  - specifications and a cost estimate for extended stabilization, dated August 12, 1982, show: 1) 280 cy of bedding or 1,000 cy of filter fabric and 1,200 cy of riprap, obtained from onsite; and 2) gradations for both $D_{50}$ = 18 inches riprap and riprap bedding.

- *August 12, 1982 – Flood Protection Construction Technical Specifications and Cost Estimate (Dames and Moore, 1981d).* These specifications included riprap and bedding gradations, and quantity and cost estimates for the extension of the flood protection.

The available documents provide a good understanding and basis for comparison to the field observations. The specifications for the original riprap protection were not located; however, the available construction documents (Addendum No. 2 and the Construction Observation Report) provided the specified riprap gradation.

### 2.3 Results of Data Collection

During the field observations, good quality riprap was found along most of the flood dike, with some exceptions. A few minor areas where riprap was sparse or non-existent were noted and are discussed further in Sections 5.0 and 6.0. These areas should be supplemented during the interim repair as discussed in Section 6.0.

The riprap in Reach 1 and Reach 2 appears to be smaller than required in the construction specifications (Dames and Moore, 1981d). The thickness of the riprap found in the test pits was generally two feet or more. The riprap bedding sampled appears to be representative of the riprap bedding but did not meet the construction specification. The riprap bedding gradation is discussed further in Section 5.0.

## 3.0 Flow Rate Development

This section describes the development of the 100-year flood based on regression equations and summarizes previous studies for the 100-year flow.

### 3.1 100-Year Flow Development

Four methods were used to compute values for the 100-year flow for comparative purposes. These methods used either: 1) regression equations based on basin characteristics including area and elevation; or 2) flood frequency analysis based on stream gage data. These flows ranged from 2,140 cfs to 2,800 cfs, as shown in Table 3.1.

Methodologies 1, 2, and 3 all use the respective regression equations shown in Table 3.1. "The Regional Regression Equations for Estimation of Natural Stream flow Statistics in Colorado," was published in 2009 (Methodology 3) and supplants the publications for Methodologies 1 and 2 due to additional data.

Methodology 4 is one that is recommended by the USGS and allows for a separate comparison of the methods. For this methodology data from USGS stream gage 09165000, located downstream of the Rico site on the Dolores River, was used to perform a flood frequency analysis. The results of the analysis were translated upstream to the Rico site which has a smaller basin area using the equation shown in Table 3.1. This stream gage has 56 years of data to support analyses performed on the flow data. The calculations for the flow rates and the variable definitions are included in Appendix B3. The "expected probability method" was used in Methodology 4 computations. The expected probability adjustment is an attempt to correct for a certain bias in the frequency curve computation due to the shortness of the record (a sample rather than the entire population). The expected probability adjustment is most often used in estimates of annual flood damages and establishing design flood criteria, and is the method used by the USACE as standard practice. The expected probability will add some conservatism to the traditional procedure. The computed 100-year curve flow at USGS stream gage 019650000 is 2,795 cfs which translates to a flow rate of 2,137 cfs immediately downstream of the Rico site; taken at the State Highway 145 Bridge.

### 3.2 Previous Studies

Two previous flood studies of the watershed were identified. These studies are: 1) "Flood Hazard Areas" by Dames and Moore (1981a); and 2) "Documentation for Hazard and Constraint Maps by Wilbur (1995). Several other studies adopted the results published by Chris Wilbur in 1995 (Grayling Environmental, 2006; CWCB, 2000; and Matrix Design Group, 2004).

Six different analyses were used to compute various return period flow rates in the Dames and Moore Report (1981). The analyses resulted in flows ranging from 2,120 to 3,064 cfs with a recommended flow was 2,720 cfs based on the Flood Frequency Analysis approach using the USGS stream gage data through 1981.

The Wilbur report formulated a regression equation for the flow rate, which was later adopted by the CWCB (2000). This formula yields approximately 2,800 cfs as the 100-year flood flow for the town of Rico. Review of the CWCB publication indicates that the regression formula developed by Wilbur should be used for informational purposes only for comparison of peak flow values. In addition, they recommend using the USGS publication for computing peak flow values.

### 3.3 Recommended 100-year Flow Rate

As discussed above, Methodologies 3 and 4 are the most appropriate for the determination of the 100-year flow rates. Both supersede Methodologies 1 and 2, and data used in previous reports since more data is now available on which to base the regression equations and perform flood frequency analyses. Therefore, a flow rate of 2,200 cfs is recommended for the 100-year flow rate through the Rico site.

### 3.4 Additional Flow Rates

In addition, utilizing the preferred Methodology 4 and comparing to Methodology 3, a flow return interval curve was developed. From this curve, flow rates for lesser return intervals could be estimated, and were modeled as discussed in Section 4.0. Calculations for the development of this curve are included in Appendix B3.

The 10-, 25- and 50-year return interval peak flows were modeled to provide a basis for accommodating potential more frequent flood flows during construction.

The measured peak flow at the stream gage since 1981 is 2,170 cfs, which occurred in 1984. The spring of 1995 saw a similar measured peak flow of 2,140 cfs. The 2,170 cfs flow rate was translated upstream using the USGS equation (USGS, 2000), which resulted in an estimated flow of 1,660 cfs at the Rico site. This equates roughly to the 25-year return event based on the return interval curve that was developed as described previously. This indicates that the riprap protection for the flood dike designed and constructed in 1981 and 1982 has withstood at least the 25-year return period flood without significant degradation.

# 4.0 River Modeling

## 4.1 Model Development

### 4.1.1 Modeling Approach

A HEC-RAS model was developed to route flow in the Dolores River from north of the flood dikes (Station 54+45) to approximately 900 feet downstream of the Highway 145 bridge (Station -9+15). The river stationing is shown on Figure 2.1. Geometric data and model parameters were derived from multiple sources using standard hydraulic modeling practices. The following subsections describe the methodology, data, and assumptions used for development and validation of the hydraulic model.

HEC-RAS Version 4.1.0 (USACE, 2010) was used to model steady-state flows allowing a mixed flow regime. Normal depth was used for both upstream and downstream boundary conditions. Channel slopes of 0.008 ft/ft and 0.017 ft/ft were used to calculate normal depth at the upstream and downstream boundaries, respectively. These slopes were derived from the river channel water surface as represented in the August 2011 site topographic data described in Part A of this report.

### 4.1.2 DEM Development for GIS

The CAD contour lines were used to develop the Digital Elevation Model (DEM) for GIS, which provided the surface file needed for the HEC-GeoRAS that integrates HEC-RAS with GIS. The Spatial Analyst tool, Natural Neighbor in ArcGIS v 9.3 (ESRI, 2010) was used to create an ESRI GRID surface from the points.

### 4.1.3 Flow Rates

The 100-year flow rate of 2,200 cfs, established in Section 3.0, was modeled as a steady-state flow in HEC-RAS. In addition, the flow rates of 1,275 cfs, 1,630 cfs, and 1,900 cfs, representing the 10-year, 25-year and 50-year return events, respectively, were modeled based on the return period curve described in Section 3.0.

### 4.1.4 Cross Section Locations

Channel slope, variation in geometry and curvature, critical locations, pond locations, and highway crossings were considered when selecting cross-section locations for developing the HEC-RAS model. Based on review of the topography in relation to observations made during field reconnaissance and requirements for the riprap analysis, a few critical locations where potential temporary and/or permanent mitigation measures may be needed were identified. Locations for the critical areas are shown in plan view on Figures 4.1 through 4.5. Model results at these locations are discussed below in Section 4.3.

The first critical location was identified approximately 900-feet upstream of Pond 18, at Station 48+35 (Figure 4.1). A swale in the left bank of the river, upstream of the man-made flood dike provides an avenue for high flows to flood the area north of Pond 18. If river floodwaters were to overtop the bank at this location, they would continue to travel south and directly into Pond 18 and through the pond network at the site. The next critical location is at Pond 18 (Figure 4.2), where the dike elevation drops six or more feet and reduces the available freeboard protecting the pond from the river. The critical section shown in Figure 4.2 represents the proposed interim solids management storage area to be located in Pond 13. Other locations of interest were identified where significant changes in topography occur. Another critical location is at Pond 9 and 10 (Figure 4.4), where, similar to Pond 18, the dike elevation drops more than eight feet and significantly reduces the available freeboard. The final critical location is at the bridge crossing (Highway 145) just north of Rico (Figure 4.5) where there is a potential for increased backwater effects due to the embankment constriction at the bridge.

### 4.1.5 Manning's 'n'

Spatially variable land surface roughness was represented at each cross section based on field photographs taken during site visits and the aerial imagery. Polygons were created in ArcGIS (2010) to represent the average Manning's 'n' for the different terrain types identified, and the average values were selected for the appropriate vegetation type. Development of these values was based on the USGS paper, "Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains" (USGS, 1984) and compared to associated 'n' values published in Chow (1959). The computed 'n' values include considerations for channel irregularity, variation, obstructions, vegetation and degree of meandering. The project area was characterized with 10 different Manning's 'n' values.

In general, a 'Manning's 'n' value of 0.05 was applied to the main channel inside the banks that is wet most of the year and contains little to no vegetation. The overbank roughness ranged from 0.14 to 0.20 for heavily vegetated, largely undisturbed areas, and from 0.08 to 0.13 for somewhat vegetated, disturbed areas. These values are presented in Tables 4.1 and 4.2 and the polygon coverage of the Manning's 'n' roughness coefficients is shown on Figures 4.6 and 4.7. Detailed descriptions of the calculation methodology are located in Appendix B4.

## 4.2 Model Refinement

### 4.2.1 Manning's 'n'

The cross-section interpolation function in the HEC-RAS geometry file estimated an initial distribution of the Manning's 'n' coefficients between two primary cross sections. This automated calculation performed by the model does not provide an accurate representation of the actual spatial distribution of the polygon coverage displayed in Figures 4.6 and 4.7. Using the Manning's 'n' polygons overlaid on top of the interpolated cross sections, manual adjustments were made to the Manning's 'n' values in all the interpolated cross sections. This approach provided a more accurate representation of the actual overbank conditions and mitigated some model instabilities.

### 4.2.2 Levees

Levees were established to prevent HEC-RAS from modeling split flow, described below in Section 4.2.5, where it was not desired. Due to the varying topography, various side channels come and go that would never see flow unless the water surface elevation in the river exceeded the height of the berm separating the channels. The majority of the levees were located along the left bank flood dike protecting the ponds.

Beginning around station 17+50 and extending through station 15+00, during initial runs, the water surface elevation started to overtop the flood dike, alternating above and below the dike from one cross section to the next (Figure 4-17). This resulted in slightly inconsistent output and model instability. To minimize the inconsistency, the levee elevations were adjusted plus/minus up to one foot from the upstream-most location at which overtopping begins to the downstream location where overtopping depth is sufficiently above the flood dike elevation. The result is predicted overtopping of the flood dike downstream of station 17+56.

### 4.2.3 Ineffective Flow Areas

Ineffective flow areas were established to represent those locations that the water may reach but not actively convey. This includes low-lying overbank areas where water might pool, or more relevant to this project, all of the St. Louis ponds (Figure 4-17). Ineffective flow zones were created for all pond areas inside the flood dikes. These ineffective flow areas were toggled to the permanent mode, meaning that even when the water surface elevation was higher than the top elevation of the specified ineffective flow area, only the flow above that top elevation became active flow. Water within the confines of the pond was stored, but did not contribute to flow. This setting represented the more conservative scenario when the flood dikes were initially overtopped and in place, with higher water surface elevations.

### 4.2.4 Bridge

The actual bridge structure was not included in the HEC-RAS model (Figure 4-18). As previously described, cross sections were located to model the constriction that occurs as a result of the highway embankment on each side of the bridge abutments. The model shows that the increased backwater extends from the constriction, upstream to about Station 4+30 (800 feet downstream of Pond 5). This was considered sufficiently downstream of the area of interest not to require more detailed assessment.

### 4.2.5 Split Flow

A 1,150-foot long segment of the Dolores River upstream of Pond 18, local stations 49+50 through 38+00, includes a sizeable side channel that is separated from the main river stem by a large berm that is believed to be man-made (Figures 4-15 and 4-16). This side channel is east of the main river channel, next to the Rico site. The main river channel and side channel merge around Station 36+00, adjacent to Pond 18. River flows reach this side channel only when the flow rates are high enough that the water surface elevation overtops the berm. The invert elevation of the side channel is lower than the main channel at corresponding stations and the difference is relatively large in areas. Because of this, it is believed that it served as the primary channel for the river at some time in the past.

At 2,200 cfs, the water surface elevation is above the berm for the majority of this section of river. For the locations where the water surface elevation is below the berm, the flow within the cross section was modeled as split flow. This means the flow area is distributed between the two channels.

Where more accurate results are desired within the limitations of the HEC RAS model, an adjustment could be made to model the main channel and the side channel as two parallel but separate river reaches that are connected by an overflow weir. With the weir, the model calculates the rate at which water overtops the berm and discharges into the side channel as it travels down the main channel. However, this type of analysis requires a time element to provide an estimation of how quickly the side channel would fill up and the water surface elevation between the two to equalize. An inflow hydrograph of the 100-year flood event in combination with the HEC-RAS unsteady flow function would be required to complete an analysis to this level of detail.

Two potential scenarios were considered regarding the side channel flow during a 100-year event. The first is the berm overtopping depth occurs for a shorter duration than it takes for the flow to fill up the side channel and its water surface elevation remains lower than in the main channel. The second is the berm overtopping depth is high enough for a long enough duration that the side channel fills up and the water surface elevation equalizes across the entire channel. This second scenario is most closely represented by the split flow regime in the HEC-RAS model and represents the more conservative scenario for assessing both channel velocity and freeboard.

## 4.3 Results

### 4.3.1 Overview

Model results were reviewed at the five cross section locations identified in Section 4.1.4. The model results at the first three upstream cross sections – (1) 900-feet upstream of Pond 18; (2) next to Pond 18; and (3) next to Pond 13 – indicate that a minimum of three feet of freeboard is achieved at the flood dikes, which is considered acceptable based on most design standards for levees (FEMA, 2003). At Pond 9 and 10, where the flood dike abruptly drops about 8 feet, the freeboard is reduced to approximately 2 feet, and continues to decrease downstream until overtopping begins at about Pond 8 (Figure 4.13 and 4.17). The cross section results at these locations and select others are presented on Figures 4.8 – 4.14. The four designations in the legend of each cross section figure are: 1) 'WS 100-yr' which designates the 100-year water surface elevation; 2) 'Crit 100-yr' which designates the critical 100-yr water surface; 3) 'Ground', representing the existing ground surface; and 4) 'Bank Stn' which designates the channel and the overbanks.

As discussed in Section 4.2.4, the backwater effects from the constriction at the bridge did not extend into the project area of interest. Hence, it was determined that the cross section at this location is no longer considered a critical location and is not discussed any further.

Velocities though the modeled reach averaged about 8 to 10 fps with local areas up to 12 fps. The implication of these velocities on the riprap analysis is discussed further in Section 5.0 of this report.

### 4.3.2 Sensitivity

A sensitivity analysis was conducted to assess the effect of an increase in Manning's 'n' on simulated water surface elevations for the flow rate of 2,200 cfs. Manning's 'n' was increased from the base values discussed in Section 4.2.1 by 25 percent. Model results are shown in Table 4.5. Changes between the base case and the increased water Manning's 'n' are shown in Table 4.6. Different stations exhibited variable levels of sensitivity to changes in Manning's 'n'. Overall, less than a one-foot increase in water surface elevation resulted from the 25 percent increase in Manning's 'n'. Based on this limited change in elevation the base Manning's 'n' values (shown in Tables 4.1 and 4.2) were used in the final model.

### 4.3.3 Inundation Mapping

Inundation polygons were generated based on outputs from the HEC-RAS model described above. HEC-RAS output was processed in ArcGIS using the HEC-GeoRAS extension. The raw inundation polygons resulting from the automated ArcGIS processing were manually adjusted as necessary by removing isolated areas of inundation and smoothing some of the lines produced in the automated processing.

The inundation maps (Figures 4.15 through 4.18) show the inundation polygons for the 100-year floodplain on the aerial imagery flown in August 2011. All maps are plotted at a scale of 1":100', and are in the Colorado State Plane coordinate system (central zone) with elevations based on NAVD88.

# 5.0 Riprap Analysis

An evaluation of the existing riprap stability to withstand the erosive forces of the 100-year flood modeled in HEC-RAS as described in Section 4.0 was conducted between Station 11+00 (Pond 5) and Station 47+00 at the upper end of the site. The analysis area is depicted in plan and profile on Figures 5.1 through 5.4. The analysis included an evaluation of stone sizing, revetment toe scour, bank slope steepness, riprap layer thickness and gradation, and under layer filter gradation and thickness.

## 5.1 Methodology

The current Army Corps of Engineers hydraulic channel design methodology, presented in EM1110-2-1601, *Hydraulic Design of Flood Control Channels* (USACE, 1994) was used to assess the existing riprap stability during the 100-year design flood. Additionally, recommendations and guidelines given in the Transportation Research Board Report 568 *Riprap Design Criteria, Recommended Specifications, and Quality Control* (TRB, 2006) were used where appropriate as described below. For revetment toe scour, a competent velocity methodology as outlined in *Computing Degradation and Local* Scour (USBR, 1984) was adopted.

### 5.1.1 Existing Revetment Characteristics

For purposes of analysis, the existing revetment has been subdivided into a series of reaches with similar characteristics, with the primary stability factor, existing riprap size, dominant. The characteristics for a given reach, particularly riprap size, are set to the most conservative typical value for the reach based on the field photos and observations described in Section 2.0. Other characteristics, such as bank slope, are interpolated between field measurement points. There may be several small localized areas within any given reach that require repair or maintenance because they are substandard relative to the typical characteristics of the reach. Any such localized areas will be mitigated during the construction of interim or final dike improvements as discussed in Section 6.0. The analyses presented herein do not consider these localized areas but rather consider the reach stability in a global sense. Reach extents and typical characteristics are summarized in Table 5.5.

### 5.1.2 Rock Size

The EM1110-2-1601 methodology is considered to be the best available hydraulic channel riprap sizing methodology based on an extensive analysis of various riprap sizing methodologies because it is the most comprehensive and accounts for depth and channel curvature (TRB, 2006) and is suitable for both manmade and natural channels where bank slopes are 1.5H:1V and flatter. The base methodology applies to channel slopes of up to 2 percent (EM1110-2-1601 Equation 3-3). Where slopes are steeper, the methodology recommends using a different equation (EM1110-2-1601 Equation 3-5) appropriate for rock-lined chutes. Channel slopes in the Dolores River adjacent to the Site range from 1.1 percent to 2.5 percent, as shown in Table 5.6. Additionally, the Ishbash formula for stilling basin turbulent flows as presented in HDC 12-1 (USACE, 1970) is recommended for use in subcritical/supercritical flow transition areas. Due to the range in channel slopes and the flow regimes, all three equations were used in this analysis and their applicability are summarized in Table 5.1.

The Dolores River channel adjacent to the St. Louis Ponds includes all of the applicable analysis cases (described above) in the modeled 100-year design flood. For this analysis, EM1110-2-1601 Equation 3-3 is computed in all situations. EM1110-2-1601 Equation 3-5 and/or the Ishbash formula are computed according to conditions described above, and the largest $D_{30}$ rock size of the applicable equations and EM1110-2-1601 Equation 3-3 are recommended.

### 5.1.3 Design Velocity

Velocity input to the equations discussed in the previous section is derived from the HEC-RAS model presented in Section 4.0. The HEC-RAS model provides two depth-averaged velocity outputs: channel and total. The channel velocity is representative of high velocity flow in the central channel and the total velocity is representative of the overall stream channel, including overbank areas. Per the EM1110-2-1601 methodology, these velocities can be utilized to estimate a velocity on the channel bank appropriate for input to the riprap sizing equations for bank riprap. The methodology increases velocities on the outside of bends based on channel curvature and channel width. The methodology generally recommends that the central channel be analyzed since most streams have low velocities in overbank areas. Because velocities in overbank areas of the Dolores River are relatively high, the calculations were run utilizing both channel and total velocities with their corresponding channel curvatures and widths to check that the worst case is not from an overbank velocity. The higher velocity of the two cases was selected for analysis.

Upstream (north) of approximately Station 36+00, the central channel diverges away from a secondary side channel along the existing riprapped flood dike, as described in Section 4.0. Pending further evaluation, channel velocities in the primary central channel are used as a proxy for velocities in the secondary channel. These velocities are conservative. Curvature and channel width are estimated from the secondary channel itself.

### 5.1.4 Riprap Gradations, Filtration and General Revetment Design

Approximate gradations by weight were estimated from the surface visual grid count field surveys completed as described in Section 2.0. EM1110-2-1601 and TRB Report 568 provide recommended gradation guidelines for narrowly graded riprap. EM1110-2-1601 also provides guidelines for quarry-run riprap that may have a more broadly graded particle size distribution. Recommendations from both methodologies are summarized below, along with other applicable revetment design criteria.

### 5.1.5 Revetment Toe Scour

Undermining of the toe of a bank riprap revetment via scour of the channel bottom is one of the primary causes of riprap revetment failure (USACE, 1994). The original riprap design and construction documents described in Section 2.2 indicate that the revetment included a 5-foot wide rock apron to protect against scour-induced failure. This apron is intended to "launch" or descend into a scour hole as it forms, effectively armouring the new bank and toe of revetment created by scour in the natural river channel. This is an acceptable design per EM1110-2-1601, so long as the geometry of the apron is large enough to adequately armour the bank of the scour hole formed and the riprap is of adequate size. To assess the adequacy of the geometry of this apron relative to the depth of scour, the depth of scour expected in the natural streambed in the 100-year flood was estimated using a Competent (Limiting) Velocity Analysis (Neill, 1973) as described in *Computing Degradation and Local* Scour (USBR, 1984). The equation for scour in this analysis is:

$y_s = y_m (V_m / V_c - 1)$
where:
$y_s$ = scour depth below streambed (ft)
$y_m$ = mean channel depth (ft)
$V_m$ = mean velocity (ft)
$V_c$ = competent mean velocity of the bed material (ft/s)

The competent mean velocity for cohesionless soils is estimated by interpolating from a chart reproduced in Figure 5.5 (Niell, 1973). The competent mean velocity for materials with cohesion is based on the empirical values reproduced in Table 5.3.

The Dolores River channel streambed adjacent to the site is generally armored with a well-sorted and primarily subrounded to rounded layer of river cobbles and boulders of unknown characteristic size and thickness. Exploratory boreholes completed as part of 2011 investigations indicate that alluvium directly beneath the flood dike consists primarily of an approximately 10- to 15-foot thick well-graded silty/clayey, sandy, gravel and cobble layer (Coarse Alluvium). This layer overlies a section of silty sand / silty fine sand (with some isolated gravelly lenses) of unknown depth, but that is believed to exceed 70 feet in thickness (Fine Alluvium). The Coarse and Fine Alluvium units are plotted where encountered in the plan and profile of the flood dike (Figures 5.1 through 5.4). Information on these units, including exploratory logs and laboratory test analyses, are provided in Appendices A1 and A2 in Part A of this report. For purposes of this analysis, the natural channel streambed of the Dolores River is modeled as river cobbles and boulders (adjacent to the apron applied during construction of the flood dike) overlying the Coarse Alluvium (described above), which in turn overlies the Fine Alluvium. Particle size and layer thickness of the existing armouring river cobbles are currently unknown, so two cases based on field observations are modeled to bracket the estimated and assumed worst case scenarios for river cobble armouring as listed in Table 5.4. Case 1 represents the actual estimated scour, whereas Case 2 represents a worst case estimate.

For both analyses, the competent or limiting velocity is estimated from Figure 5.5. If the scour depth is estimated to exceed the thicknesses listed in Table 5.4, then the scour is considered to have stripped the river cobble armouring layer away and proceeds to scour into the Coarse

Alluvium layer below. The scour is then recomputed based on the estimated properties of the Coarse Alluvium. The Coarse Alluvium is assumed to have a competent velocity of 6.0 ft/s, consistent with a gravel or high resistance cohesive soil (clay).

Velocity and depth from the high velocity central channel output of HEC-RAS are utilized in the analyses similar to the riprap sizing analyses described in Section 5.2.2. The reach upstream (north) of approximately Station 36+00 uses more conservative velocity input from the primary central channel further away from the flood dike rather than the modeled secondary central channel adjacent to the flood dike.

## 5.2 Results

The existing riprap revetment has been subdivided into a series of standard reaches for purposes of these analyses. The purpose of the reaches was to group areas of similar characteristic riprap size, quality or other features together in terms of similar attributes so that erosive forces of the 100-year flood at a given station could be analyzed against the characteristics of the existing riprap. Key analysis inputs and results are presented in Table 5.6 for every even 100-foot station in the area of interest.

### 5.2.1 Adequacy of Bank Slope

Bank slope was taken from field measurements presented in Section 2.0. Between Stations 34+00 and 38+00, the existing bank exceeds 1.5H:1V bank steepness guidelines discussed previously in Section 5.1.3. As discussed in the following section, this reach is believed to contain buried riprap which may or may not be of adequate slope and/or size.

### 5.2.2 Adequacy of Riprap Size

For all stations, the adjusted bank velocity computed using the velocity, curvature and width of the main central channel was critical, and these velocities and curvatures are presented in Table 5.6, along with existing bank slope and computed bank velocity. A comparison of existing riprap size ($D_{30}$, or the particle sieve size 30 percent of stones are smaller than) versus the minimum size computed from the riprap size analyses described previously and a safety factor computed from the ratio of these two sizes is also presented. As discussed below, and illustrated in Table 5.6 the results indicate that several areas along the dike do not meet an EM1110-2-1601 recommended minimum Safety Factor of 1.1.

The reach alongside Pond 18 may contain buried riprap based on test pits and the original construction documentation. The size utilized in the analyses, however, was based on the approximate gradation of the visible surface materials, which are substantially finer. These surface materials are likely to be stripped away in the design flood leaving riprap of mostly unknown size and bank slope. Additionally, the existing bank slope in this area is over-steepened beyond recommended criteria (underlying riprap may or may not be over-steepened) and is recommended for flattening as described later unless or until riprap of adequate size and steepness is shown to be present by additional focused field investigation.

The area including Stations 20+00 to 21+00 is at the outside of a relatively tight outside channel curve, lies in an area of relatively steep channel drop, and also lies in an area where the flood model indicates that subcritical/supercritical flow transitions occur. Each of these factors cause the sizing methodology to compute significantly larger required riprap sizes. These sizes exceed both the originally constructed and design riprap sizing, and the analyses indicate that replacement of existing riprap with larger sized riprap is necessary in this area. The existing stone could be stripped and reutilized in other areas during interim construction, depending on developed construction specifications.

### 5.2.3 Adequacy of Riprap Gradation, Stone Characteristics and Thickness

As discussed in Section 2.0, riprap was visually observed to be of good quality, and has generally withstood the elements well. The stones are predominantly angular, as recommended by design guidelines as discussed previously. No data was collected on stone shape relative to riprap design guidelines, but qualitative visual observation of the riprap indicates that stone shape is not deficient. Furthermore, this is not a major factor in revetment stability, nor does it appear to have resulted in any stability issues in the life of the revetment to date.

Riprap $D_{85}/D_{15}$ ratios of the existing riprap computed from field grid data are presented in Table 5.5. Except in areas with sizing issues described in the previous section (Reaches 3 and 4) results generally indicate that the riprap falls within or nearly within gradation guidelines presented in Table 5.2, which lists $D_{85}/D_{15}$ ratios of 1.4-2.2 and 1.5-2.5 for the Corps of Engineers and Transportation Research Board guidelines for narrowly graded riprap, respectively. Reach 1 has been noted to contain an excess amount of smaller stones in some areas (such as Grid 2 at Station 41+00), which generally reduces the computed $D_{30}$ size and results in a wider gradation. At Grid 2, the estimated $D_{85}/D_{15}$ ratio of 7.9 falls just outside the Corps of Engineer's maximum recommended ratio of 7 for quarry-run stone. In Reach 5, Grid 7C (Station 27+95), the field survey noted a very localized small pocket of stones composed partially of shale which appears to have broken down, causing both the $D_{30}$ stone size to be reduced and the gradation to widen, but this area is not considered characteristic of the reach. Any such localized areas will be identified and mitigated during the construction of interim or final dike improvements as discussed in Section 6.0.

The originally designed layer thickness of the riprap revetment was 24 inches, and test pits conducted as part of the investigation generally indicated that the riprap layer is nominally 24 inches thick. The thickness does not, however, generally meet the layer thickness criterion discussed in Section 5.1.4. In many areas, however, the riprap has a very large safety factor and the riprap layer is unlikely to be tested by the design flows. A 24-inch layer thickness would be appropriate for a $D_{50}$ size of 16 inches or less and a $D_{30}$ size of 13.3 inches or less. From Table 5.5, Reaches 1 and 2 meet this thickness criterion, whereas Reaches 5 and 6 do not. Except for Stations 20+00 and 21+00, Reaches 5 and 6 require riprap much smaller than 13.3 inches according to the analyses presented in Table 5.6. It is concluded that because the riprap is significantly oversized, the lack of thickness in Reaches 5 and 6 will not be detrimental to stability under the 100-year flood flows.

### 5.2.4 Adequacy of Bedding Gradation and Thickness

Table 5.7 presents the results of gradation analyses collected on the filter materials beneath the riprap layer. $D_{85}$ is calculated for each gradation for comparison to the $D_{15}$ of the riprap to check filter compatibility of the two layers. The $D_{85}/D_{15}$ ratio should be less than 4 to 5, using the criterion in EM 1110-2-1601. Many of the surface gradations were collected in reaches 3 and 4 (see Figure 2.1) where riprap is either not present or buried, so a direct comparison could not be made, but as discussed later, this area is recommended for reconstruction for various reasons discussed in previous sections, including steep bank angle and inadequate gradation of riprap on the bank surface. As indicated in the table, in other areas, the $D_{85}/D_{15}$ ratio meets recommended criterion.

### 5.2.5 Adequacy of Toe Scour Protection

Estimated scour depths for the best estimate case (Case 1) and estimated worst case (Case 2) assumed streambed armouring scenarios are presented in Table 5.6. For Case 1, very little streambed scour is expected to occur. For Case 2, significant scour occurs in the far upstream reach where velocities are high, as well as near the bend near Station 21+00. In both areas, the Case 2 analysis indicates the river cobble armouring would be stripped away and scour would proceed deeper into the Coarse Alluvium. Case 2 is conservative relative to streambed assumptions, except where velocities may be revised lower due to additional evaluations currently underway. The estimated scour depths in Case 2 are likely to be somewhat additionally conservative since the analysis indicates that scouring is not indicated to extend as a continuous scour channel far upstream or downstream and the overall streambed elevation along the site is not expected to change, except in isolated areas. Therefore, localized scour is likely to be somewhat more self-limiting than indicated by the analyses. Results shown in Table 5.6 and on Figures 5.1 through 5.4 indicate that in Case 2, estimated worst-case scour will not extend through the Coarse Alluvium and into the Fine Alluvium.

# 6.0 Recommendations

The recommendations presented here and in Table 5.6 are general recommendations based on analyses subdividing the flood dike into characteristic reaches. As noted above, within a given reach, there may be localized areas that may require maintenance or are substandard relative to the assigned characteristics of the reach (smaller riprap size, damage, etc.). Interim flood dike stabilization will include provisions for localized maintenance or repair based on field observations as previously described.

*A technical memorandum (TM) describing the design of the interim stabilization measures will* be submitted to EPA no later than March 1, 2012 in order to meet the requirement to finish construction of the interim stabilization measures by June 1, 2012 in accordance with the revised Work Plan schedule submitted to EPA on December 16, 2011. Design drawings and technical specifications based on the design presented in the TM will be prepared for contractor procurement and construction of the improvements. Commitment to complete the interim stabilization measures by June 1 is contingent upon EPA's concurrence that substantive compliance of the requirements of the USACE 404 ARAR has been achieved. Recommendations for interim stabilization are provided in the individual sections below and summarized on Table 5.6. In addition to the measures discussed below, the interim stabilization design will include additional surveys prior to or coincident with interim stabilization construction in key areas to identify any additional areas of the existing revetment that require maintenance or repair.

## 6.1 Reanalysis of Upper Area (Station 36+00 to 47+00)

Further evaluation of the reach north of Station 36+00 is underway to determine if the velocities in the secondary side channel in this area can be more accurately quantified. The current analyses are conservative with regard to riprap sizing. The actual velocities during the 100-year flow event in the secondary side channel would be less than those used in the current analyses (i.e., those translated from the main channel). If velocities are more accurately quantified, riprap sizing and scour will be re-evaluated. The additional evaluation will be completed in time to allow necessary measures (if any) in this area to be designed and then constructed by June 1, 2012 with the other interim stabilization measures.

### 6.2 Pond 15/18 Revetment (Stations 33+00 to 38+00)

It is recommended that this section of revetment be reconstructed due to the over-steepened slope which exceeds the recommended 1.5H:1V maximum. A portion of this reach (Station 36+00 to 38+00) will be included in the above-described side channel velocity evaluation.

### 6.3 Pond 19 Revetment (Station 33+00 to 38+00)

It is recommended that this section of revetment be reconstructed due to the inadequate riprap size and estimated depth of toe scour (discussed further below). Both larger riprap and a larger launch section are required. -.

### 6.4 Revetment Toe Scour Protection

The scour analysis indicates that the 5-foot riprap apron constructed as part of the original construction is more than adequate to protect against scour in areas where the riprap is otherwise considered stable against modeled flows. The analysis indicates that a larger apron is needed in isolated areas (where estimated scour exceeds 2.0 feet near Station 21+00 and Station 46+00). In areas where riprap size or construction is otherwise considered inadequate, the existing riprap apron should also be considered inadequate and will be reconstructed. The area of currently estimated substantial scour near Station 46+00 will be reconsidered with the further evaluation of velocities in the secondary side channel discussed previously. Estimated flood scour adjacent to the flood dike would also decrease as a result of decreased secondary side channel velocities.

### 6.5 Pond 9 Flood Dike Raise

The hydraulic analysis indicates that freeboard between Pond 11 and Pond 7 decreases from 9 ft to 0 feet (overtopping) due to an abrupt drop in the flood dike height downstream of Pond 11. Freeboard adjacent to Pond 9 will be increased to the criterion for levees recommended by FEMA (2003).

## 7.0 References

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# TABLES

**Table 3.1** – Summary of 100-year Peak Flow Rates and Methodologies

| Methodology | Source | Equation | Flow Rate |
|---|---|---|---|
| 1 | "Guidelines for Determining 100-Year Flood Flows for Approximate Floodplains in Colorado," published by Colorado Water Conservation Board (CWCB) [2004] | $Q = 213.8A^{.601}$ | 2,804 |
| 2 | Analysis of the Magnitude and Frequency of Floods in Colorado," published by United States Geological Survey (USGS) [2000] | $Q_{100} = 118.4A^{.715}$ | 2,530 |
| 3 | Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado," published by USGS [2009] | $Q_{100} = 10^{2.91} A^{.59} A_{7500}^{-.33}$ | 2,217 |
| 4 | Analysis of the Magnitude and Frequency of Floods in Colorado," published by United States Geological Survey (USGS) [2000] with Guidelines for Determining Flood Flow Frequency, Bulletin #17B of the Hydrology Subcommittee Interagency Advisory Committee on Water Data [1982]. | $Q_{ungaged} = Q_{gaged}\left(\frac{A_{ungaged}}{A_{gaged}}\right)^{x}$ | 2,137 |

**Table 4.1** – Manning's 'n' in Main Channel

| Description | Typical Manning's 'n' Range | Manning's 'n' |
|---|---|---|
| 1-4 inch gravel base, generally good condition with few obstructions and vegetation | 0.03 – 0.07 | .05 |

**Table 4.2** – Manning's 'n' in Banks

| Description | Typical Manning's 'n' Range[1] | Manning's 'n' |
|---|---|---|
| 1. Very thick 2-5 foot tall brush, many 5-30 foot tall leafy trees | 0.13 – 0.20 | 0.20 |
| 2a. Thick 2-5 foot tall brush, many 5-30 foot tall leafy trees | 0.13 – 0.20 | 0.18 |
| 2b. Very thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees | 0.11 – 0.18 | |
| 3. Thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees | 0.11 – 0.18 | 0.16 |
| 4a. Thick 2-5 foot tall brush, intermittent 5-30 foot tall leafy trees | 0.09 – 0.17 | 0.14 |
| 4b. Some to moderate 2-5 foot tall brush, many 5-30 foot tall leafy trees | 0.11 – 0.18 | |
| 4c. Some to moderate 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees | 0.11 – 0.18 | |
| 5. Some to moderate 2-5 foot tall brush, tall grasses, intermittent 5-30 foot tall leafy trees | 0.09 – 0.17 | 0.13 |
| 6a. 3/8 – 2 inch gravel base, some to moderate 0.5-2 foot tall brush/grass, some to moderate 5-30 foot tall leafy trees | 0.08 – 0.14 | 0.11 |
| 6b. Thick course riprap up to 24 inch, well graded, some vegetation (assumed future condition) | 0.08 – 0.14 | |
| 7a. 3/8 – 2 inch gravel base, intermittent 5-10 foot tall leafy trees | 0.05 – 0.10 | 0.08 |
| 7b. 3/8 – 2 inch gravel base, some to moderate 0.5-2 foot tall brush/grass, no trees | 0.06 – 0.11 | |
| 8. 3/8 – 2 inch gravel road, no vegetation | 0.04 – 0.07 | 0.06 |
| 9a. shallow water/settling ponds, bare dirt bottom | 0.04 – 0.07 | 0.04 |
| 9b. paved road | 0.04 – 0.07 | |

[1] Typical Manning's 'n' Range" represents the range of values per the referenced USGS calculation methodology.

**Table 4.3** – Typical Manning's 'n' from Chow

| Description | Typical Manning's 'n' Range |
|---|---|
| Natural Streams, Mountain – gravels and cobble bottom with few boulders | 0.03 – 0.05 |
| Flood Plains, Brush – light brush and trees | 0.04 – 0.08 |
| Flood Plains, Brush – medium to dense brush | 0.07 – 0.16 |
| Flood Plains, Trees – dense willows | 0.11 – 0.20 |
| Flood Plains, Trees – heavy timber stands, little undergrowth, flood stage below branches | 0.08 – 0.12 |
| Flood Plains, Trees – heavy timber stands, little undergrowth, flood stage reaching branches | 0.10 – 0.16 |

**Table 4.4** – Simulated water surface elevation (ft) and velocity (fps) at 2,200 cfs

| Local Station | HEC-RAS Station | WSEL (ft) | Freeboard (ft) | Chnl Vel (fps) | Tot Vel (fps) | Description |
|---|---|---|---|---|---|---|
| 46+60.7 | 5616.8 | 8840.9 | 4.1 | 12.90 | 4.82 | Critical section upstream of Ponds |
| 36+21.3 | 4577.4 | 8821.5 | 3.8 | 10.56 | 4.78 | Next to Pond 18 |
| 32+30.9 | 4187.0 | 8813.7 | 5.3 | 9.61 | 5.35 | Next to Pond 15 |
| 24+64.6 | 3420.7 | 8802.4 | 7.1 | 7.56 | 3.85 | Next to Pond 12 & 13 |
| 20+44.8 | 3000.9 | 8794.7 | 2.1 | 13.66 | 7.99 | Next to Pond 9 & 10 |
| 15+12.4 | 2468.5 | 8785.5 | -1.1 | 5.63 | 3.28 | Next to Pond 7 |
| 9+17.0 | 1873.1 | 8775.3 | N/A | 8.54 | 3.34 | Downstream of Pond 5 |

**Table 4.5** – Simulated water surface elevation (ft) and velocity (fps) at 2,200 cfs with 25% Manning's 'n' Increase

| Local Station | HEC-RAS Station | WSEL (ft) | Freeboard (ft) | Chnl Vel (fps) | Tot Vel (fps) | Description |
|---|---|---|---|---|---|---|
| 46+60.7 | 5616.8 | 8840.9 | 4.1 | 12.90 | 4.82 | Critical section upstream of Ponds |
| 36+21.3 | 4577.4 | 8821.9 | 3.4 | 9.38 | 3.85 | Next to Pond 18 |
| 32+30.9 | 4187.0 | 8814.2 | 4.8 | 8.30 | 4.52 | Next to Pond 15 |
| 24+64.6 | 3420.7 | 8803.0 | 6.5 | 6.81 | 3.41 | Next to Pond 12 & 13 |
| 20+44.8 | 3000.9 | 8795.5 | 1.3 | 11.29 | 6.20 | Next to Pond 9 & 10 |
| 15+12.4 | 2468.5 | 8785.6 | -1.2 | 5.31 | 3.10 | Next to Pond 7 |
| 9+17.0 | 1873.1 | 8775.7 | N/A | 7.42 | 2.73 | Downstream of Pond 5 |

**Table 4.6** – Change in simulated water surface elevation (ft) and velocity (fps) at 2,200 cfs

| Local Station | HEC-RAS Station | ΔWSEL (ft) | Freeboard (ft) | ΔChnl Vel (fps) | ΔTot Vel (fps) | Description |
|---|---|---|---|---|---|---|
| 46+60.7 | 5616.8 | 0.0 | 4.1 | 0.00 | 0.00 | Critical section upstream of Ponds |
| 36+21.3 | 4577.4 | 0.4 | 3.0 | -1.18 | -0.93 | Next to Pond 18 |
| 32+30.9 | 4187.0 | 0.5 | 4.3 | -1.31 | -0.83 | Next to Pond 15 |
| 24+64.6 | 3420.7 | 0.6 | 5.9 | -0.75 | -0.44 | Next to Pond 12 & 13 |
| 20+44.8 | 3000.9 | 0.8 | 0.5 | -2.37 | -1.79 | Next to Pond 9 & 10 |
| 15+12.4 | 2468.5 | 0.1 | -1.3 | -0.32 | -0.18 | Next to Pond 7 |
| 9+17.0 | 1873.1 | 0.4 | N/A | -1.12 | -0.61 | Downstream of Pond 5 |

**Table 5.1** – Riprap Sizing Methodology Equations

| | **Base (Maynord) Equation** | **Steep Channel Slope Equation** | **Subcritical / Supercritical Flow Transition – Ishbash Equation** |
|---|---|---|---|
| **Reference** | EM 1110-2-1601, Equation 3-3 | EM 1110-2-1601, Equation 3-5 | HDC 12-1, Equation 1 |
| **Applicability** | Bank slopes 1.5H:1V and flatter; channel slopes up to 2% | Low unit discharges; channel slopes from 2-12%; thickness $1.5D_{100}$; angular rock with specific gravity of 2.68 or larger; $D_{85}/D_{15}$ from 1.7 to 2.7 and uniform flow on a downslope with no tailwater | Reaches with subcritical / supercritical flow transitions |
| **Equation** | $D_{30} = S_f C_s C_V C_T d \left[ \left( \frac{\gamma_w}{\gamma_s - \gamma_w} \right)^{1/2} \frac{V}{\sqrt{K_1 g d}} \right]^{2.5}$ | $D_{30} = 1.95\ S^{0.555} q^{2/3} / (g^{1/3})$ | $D_{50} = V^2 / (2 g C_{IC}^2\ (sg - 1))$ |
| **Where** | $D_{30}$ = riprap size of which 30 percent is finer by weight<br>$S_f$ = safety factor<br>$C_s$ = stability coefficient for incipient failure,<br>$D_{85}/D_{15}$ = 1.7 to 5.2<br>= 0.30 for angular rock<br>= 0.375 for rounded rock<br>$C_V$ = vertical velocity distribution coefficient<br>= 1.0 for straight channels, inside of bends<br>= 1.283 - 0.2 log (R/W), outside of bends (1 for (R/W) > 26)<br>= 1.25, downstream of concrete channels<br>= 1.25, ends of dikes<br>$C_T$ = thickness coefficient<br>= 1.0 for thickness = $1D_{100}$(max) or 1.5 $D_{50}$(max), whichever is greater<br>$C_{IC}$ = Ishbash coefficient<br>= 0.86 for high turbulence flow (used in these analyses)<br>= 1.2 for low turbulence flow<br>d = local depth of flow (same location as V)<br>$G_W$ = unit weight of water, weight/volume<br>V = local depth-averaged velocity, $V_{SS}$ for side slope riprap<br>$K_1$ = side slope correction factor (see d(1) below)<br>S = slope of bed<br>R = Centerline radius of channel bend<br>W = Channel width corresponding to V<br>q = unit discharge<br>sg = specific gravity of stone<br>g= acceleration of gravity | | |

**Table 5.2** – Summary of Stone Characteristic Design Guidelines

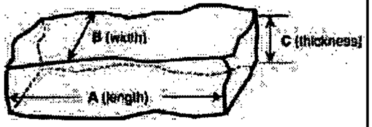
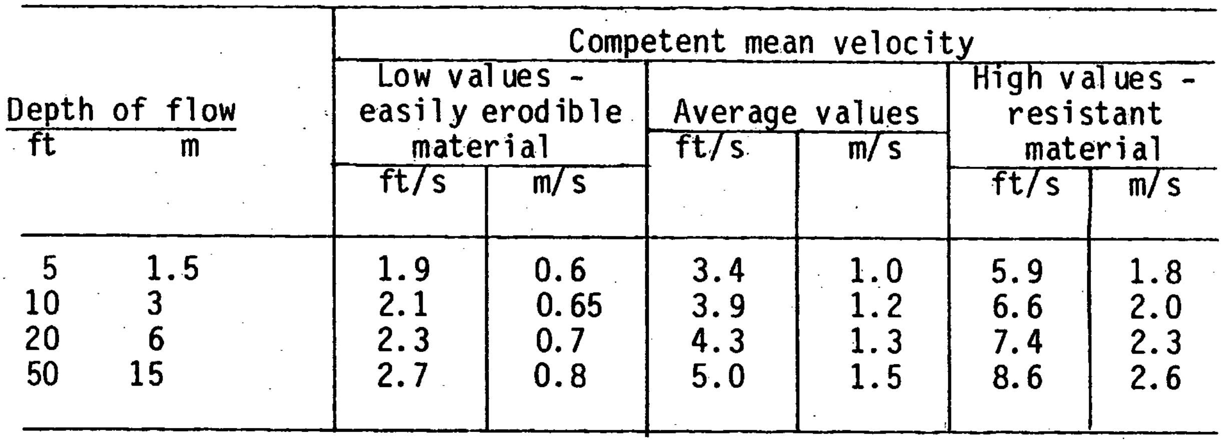
| **Methodology / Reference** | **EM 1110-2-1601; Standard Gradations** | **EM 1110-2-1601; Quarry-run Stone** | **TRB Report 568** |
|---|---|---|---|
| Stone Shape<br> | **Rounded stone**: 25% larger in diameter; placed on flatter slopes (not applicable to quarry-run)<br>**Quarry stone**: Predominantly angular stones; <30% of stones should have ratio of A/C > 2.5; <15% of stones should have ratio of A/C > 3.0; no stone shall have an A/C ratio > 3.5 | | A/C <3 |
| Gradation | Standardized gradations: $D_{85}/D_{15}$ of 1.4-2.2; but can be increased up to 3 | $D_{85}/D_{15} < 7$; not gap graded; finer fraction may serve as filter | Well graded gradations are better for riverine environments; uniform gradations are better for coastal wave attack. The target uniformity ratio (d85/d15) is 2.0, and the range is from 1.5 to 2.5. |
| Layer Thickness | Greater of $D_{100}$ or $1.5D_{50}$; increase by 50% when placed underwater | | Same as EM 1110-2-1601 |
| Revetment Slope | 1.5H:1V max, except where hand-placed stoned keyed into bank is used | 1.5H:1V max | Same as EM 1110-2-1601 |

**Table 5.3** – Guide to Competent Velocities for Cohesive Soils (Pemberton and Lara, 1984)



| Depth of flow | | Competent mean velocity | | | | | |
|---|---|---|---|---|---|---|---|
| | | Low values - easily erodible material | | Average values | | High values - resistant material | |
| ft | m | ft/s | m/s | ft/s | m/s | ft/s | m/s |
| 5 | 1.5 | 1.9 | 0.6 | 3.4 | 1.0 | 5.9 | 1.8 |
| 10 | 3 | 2.1 | 0.65 | 3.9 | 1.2 | 6.6 | 2.0 |
| 20 | 6 | 2.3 | 0.7 | 4.3 | 1.3 | 7.4 | 2.3 |
| 50 | 15 | 2.7 | 0.8 | 5.0 | 1.5 | 8.6 | 2.6 |

**Table 5.4** – Flood Dike Toe Scour Analysis Scenarios

| Case | Characteristic Bed Material Sieve Size (Inches) | Effective Armoring Thickness (inches) |
|---|---|---|
| 1 – Best Estimate | 6 | 24 |
| 2 – Estimated Worst Case | 3 | 12 |

### Table 5.5 - Field Data Gradation Summary and Characteristic Riprap Size by Reach

| | Field Data Gradation Analysis Summary | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reach** | **1** | **2** | **3** | | **4** | | | **5** | | | **6** | | | |
| **Field Station** | ~ 44+50 | 41+00 | 36+50 | 36+00 | 35+00 | 33+65 | 33+55 | 31+25 | 28+61 | 27+95* | 26+47 | 23+72 | 21+00 | 19+50 |
| **Model Station** | 44+50 | 41+00 | 36+50 | 36+00 | 35+00 | 33+65 | 33+55 | 31+25 | 28+61 | 27+95 | 26+47 | 23+72 | 21+00 | 19+50 |
| **Grid** | **1** | **2** | **3B** | **3C.2** | **3D** | **4B** | **5B** | **6B** | **7B** | **7C** | **8B** | **9B** | **E4** | **E5** |
| **$D_{85}$ (in)** | 20.5 | 23.8 | 2.7 | 27.0 | 2.0 | 2.8 | 26.2 | 28.5 | 28.4 | 27.5 | 28.7 | 26.7 | 26.6 | 27.3 |
| **$D_{50}$ (in)** | 16.5 | 15.5 | 0.5 | 18.7 | 0.7 | 0.9 | 16.8 | 22.2 | 21.9 | 18.3 | 22.9 | 19.1 | 18.9 | 19.8 |
| **$D_{30}$ (in)** | 13.0 | 9.4 | 0.1 | 13.3 | 0.4 | 0.5 | 9.8 | 18.8 | 18.7 | 9.8 | 17.9 | 15.6 | 15.2 | 16.6 |
| **$D_{15}$ (in)** | 9.5 | 3.0 | 0.0 | 0.7 | 0.1 | 0.3 | 1.1 | 15.5 | 15.5 | 1.6 | 10.3 | 11.1 | 9.8 | 13.2 |
| **$D_{85}/D_{15}$** | 2.2 | 7.9 | 787.6 | 41.4 | 29.8 | 9.4 | 23.6 | 1.8 | 1.8 | 17.1 | 2.8 | 2.4 | 2.7 | 2.1 |

* - Reach 5, Station 27+95, Grid 7C is a localized area containing stones composed of shale that have partially broken down; area is not considered characteristic of the reach

| Characteristic Riprap Size by Reach for Analysis | | | | |
|---|---|---|---|---|
| **Reach** | **Begin** | **End** | **$D_{30}$ (in)** | **$D_{15}$ (in)*** |
| 6 | 11+00 | 27+00 | 15.0 | 9.5 |
| 5 | 27+00 | 33+00 | 18.0 | 15.5 |
| 4 | 33+00 | 35+20 | 0.4 | - |
| 3 | 35+20 | 36+90 | 0.4 | - |
| 2 | 36+90 | 41+00 | 9.4 | 9 |
| 1 | 41+00 | 47+50 | 13.0 | 9.5 |

* - Selected conservatively for filter analysis

## Table 5.6 - Riprap Analysis Model Results and Recommendations

| Feature | Station | Channel Parameters | | | Existing Bank Slope (:1V) | Bank Riprap Analysis Velocity (ft/s) | Subcritical / Supercritical Transition Zone? | Riprap D30 (inches) | | | Safety Factor (Minimum 1.1 Recommended) | Estimated Scour (ft) | | Recommendations for Interim Stabilization |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Slope (%) | Channel Velocity (ft/s) | Curvature (Width / Radius); + = outside bend | | | | Characteristic Riprap Reach | Minimum Required (SF=0) | Estimated Existing | | Case 1 - Best Estimate | Case 2 - Worst Case | |
| Upper Area | 47+00 | 2.0% | 10.7 | 0.04 | 2.1 | 11.8 | Yes | 1 | 14.7 | 13.0 | 0.9 | 0.0 | 5.4 | Develop less overly conservative velocity analysis for split flow in the secondary side channel; reanalyze riprap sizing, gradation and scour; provide adequate riprap size and scour protection depending on analysis results. |
| | 46+00 | 1.6% | 12.6 | 0.07 | 2.1 | 13.0 | Yes | | 20.3 | 13.0 | 0.6 | 0.5 | 5.4 | |
| | 45+00 | 1.6% | 10.3 | 0.07 | 2.1 | 13.3 | Yes | | 14.6 | 13.0 | 0.9 | 0.6 | 4.4 | |
| | 44+00 | 2.2% | 7.1 | 0.07 | 2.1 | 13.5 | Yes | | 15.4 | 13.0 | 0.8 | 0.7 | 3.8 | |
| | 43+00 | 1.9% | 6.9 | 0.07 | 2.1 | 13.8 | | | 16.7 | 13.0 | 0.8 | 0.7 | 3.4 | |
| | 42+00 | 1.7% | 6.9 | 0.07 | 2.1 | 14.0 | | | 17.2 | 13.0 | 0.8 | 0.8 | 3.7 | |
| | 41+00 | 2.1% | 6.3 | 0.07 | 2.1 | 14.3 | | | 17.7 | 9.4 | 0.5 | 0.9 | 4.1 | |
| | 40+00 | 2.5% | 5.8 | 0.07 | 1.9 | 14.5 | | | 19.8 | 9.4 | 0.5 | 1.0 | 4.6 | |
| | 39+00 | 2.2% | 6.5 | -0.06 | 1.7 | 6.5 | | 2 | 8.3 | 9.4 | 1.1 | 0.0 | 0.0 | |
| Pond 18 | 38+00 | 1.8% | 7.8 | -0.06 | 1.5 | 7.8 | | | 4.8 | 9.4 | 1.9 | 0.0 | 0.0 | Reconstruct reach with maximum 1.5H:1V slope and adequate riprap and launch section size; Station 36+00 to 38+00, include recommendations from reach above |
| | 37+00 | 1.7% | 9.3 | -0.06 | 1.2 | 9.3 | | | 10.3 | 9.4 | 0.9 | 0.0 | 0.0 | |
| | 36+00 | 1.6% | 10.4 | 0.09 | 2.1 | 10.8 | | 3 | 8.3 | 0.4 | 0.0 | 0.0 | 0.6 | |
| | 35+00 | 1.4% | 9.4 | 0.04 | 1.4 | 12.2 | | | 14.6 | 0.4 | 0.0 | 0.2 | 5.1 | |
| Pond 15 | 34+00 | 1.5% | 9.1 | 0.08 | 1.4 | 9.2 | | 4 | 7.5 | 0.4 | 0.1 | 0.0 | 0.0 | |
| | 33+00 | 1.6% | 9.4 | 0.08 | 2.0 | 10.0 | | | 7.3 | 0.4 | 0.1 | 0.0 | 0.4 | |
| | 32+00 | 1.8% | 9.4 | 0.04 | 2.4 | 9.4 | | 5 | 5.4 | 18.0 | 3.4 | 0.0 | 0.1 | No action |
| | 31+00 | 1.8% | 8.6 | -0.23 | 2.7 | 9.0 | | | 4.6 | 18.0 | 3.9 | 0.0 | 0.0 | |
| | 30+00 | 1.9% | 8.2 | -0.11 | 2.3 | 8.6 | | | 4.4 | 18.0 | 4.1 | 0.0 | 0.0 | |
| Ponds 11, 12 and 14 | 29+00 | 1.9% | 9.0 | 0.04 | 1.9 | 9.0 | | | 5.3 | 18.0 | 3.4 | 0.0 | 0.0 | |
| | 28+00 | 1.9% | 9.8 | 0.04 | 2.1 | 9.8 | | | 6.1 | 18.0 | 3.0 | 0.0 | 0.2 | |
| | 27+00 | 1.8% | 10.6 | 0.04 | 1.9 | 10.6 | | | 7.6 | 18.0 | 2.4 | 0.0 | 0.6 | |
| | 26+00 | 1.7% | 9.5 | 0.04 | 1.7 | 9.5 | | 6 | 5.9 | 15.0 | 2.6 | 0.0 | 0.0 | |
| | 25+00 | 1.5% | 8.1 | -0.04 | 1.7 | 8.7 | | | 4.7 | 15.0 | 3.2 | 0.0 | 0.0 | |
| | 24+00 | 1.4% | 8.9 | -0.04 | 1.7 | 8.9 | | | 4.8 | 15.0 | 3.1 | 0.0 | 0.0 | |
| | 23+00 | 1.4% | 10.9 | -0.04 | 2.0 | 10.9 | | | 7.6 | 15.0 | 2.0 | 0.0 | 1.3 | |
| | 22+00 | 1.5% | 12.7 | 0.09 | 2.4 | 12.7 | | | 11.0 | 15.0 | 1.4 | 0.2 | 6.9 | Reconstruct reach as necessary with larger riprap and/or larger launch section to mitigate potential scour as necessary |
| Ponds 7, 8 and 9 | 21+00 | 2.2% | 13.3 | 0.09 | 2.7 | 13.3 | Yes | | 22.7 | 15.0 | 0.7 | 0.6 | 6.5 | |
| | 20+00 | 2.2% | 12.1 | 0.09 | 2.7 | 12.9 | Yes | | 18.7 | 15.0 | 0.8 | 0.4 | 6.1 | |
| | 19+00 | 1.4% | 8.7 | 0.09 | 2.7 | 13.4 | Yes | | 11.7 | 15.0 | 1.3 | 0.6 | 7.9 | |
| | 18+00 | 1.1% | 9.3 | 0.04 | 2.7 | 11.7 | | | 8.2 | 15.0 | 1.8 | 0.0 | 5.7 | Increase launch section for scour protection as necessary |
| | 17+00 | 1.3% | 8.7 | 0.04 | 2.6 | 11.6 | | | 8.0 | 15.0 | 1.9 | 0.0 | 5.0 | |
| | 16+00 | 1.8% | 7.1 | -0.09 | 2.6 | 7.4 | | | 2.7 | 15.0 | 5.6 | 0.0 | 0.0 | No Action |
| | 15+00 | 2.2% | 5.7 | -0.09 | 2.5 | 7.4 | | | 7.5 | 15.0 | 2.0 | 0.0 | 0.0 | |
| Ponds 5 and 6 | 14+00 | 1.9% | 6.5 | 0.04 | 2.5 | 7.4 | | | 2.8 | 15.0 | 5.4 | 0.0 | 0.0 | |
| | 13+00 | 1.7% | 7.1 | 0.09 | 2.4 | 7.2 | | | 2.9 | 15.0 | 5.2 | 0.0 | 0.0 | |
| | 12+00 | 2.1% | 7.4 | 0.09 | 2.4 | 7.9 | | | 8.7 | 15.0 | 1.7 | 0.0 | 0.0 | |
| | 11+00 | 2.3% | 7.7 | 0.04 | 2.3 | 7.7 | | | 9.3 | 15.0 | 1.6 | 0.0 | 0.0 | |

## Table 5.7 - Filter Criteria Check of Riprap against Filter Bedding

| | **Station** | **19+50** | **27+80** | **33+65** | **33+75** | **34+00** | **35+00** | **36+00** | **36+50** | **36+00** | **41+00** | ***August, 1982 Construction Specification*** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Sample** | **E5** | **8** | **E2** | **4A** | **E6** | **3D** | **E1** | **3A** | **3C1** | **E8** | ***Min*** | ***Max*** |
| **Filter Bedding Gradation, Percent Passing Sieve (inches)** | 8 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | ***100*** | ***100*** |
| | 6 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | |
| | 5 | 100 | 100 | 100 | 79 | 100 | 100 | 100 | 100 | 100 | 100 | | |
| | 4 | 100 | 84 | 88 | 69 | 100 | 95 | 100 | 91 | 100 | 100 | | |
| | 3 | 100 | 77 | 65 | 56 | 100 | 95 | 78 | 88 | 88 | 89 | ***30*** | ***70*** |
| | 2 | 63 | 59 | 37 | 50 | 92 | 89 | 61 | 83 | 82 | 65 | | |
| | 1 | 29 | 42 | 12 | 41 | 78 | 85 | 56 | 74 | 66 | 31 | | |
| | 0.75 | 24 | 39 | 8 | 36 | 71 | 84 | 54 | 69 | 60 | 25 | | |
| | 0.375 | 17 | 33 | 3 | 28 | 55 | 77 | 50 | 59 | 45 | 19 | ***10*** | ***30*** |
| | $D_{85\ \text{Filter Bedding}}$ | 2.5 | 4.1 | 3.9 | 5.3 | 1.4 | 1.0 | 3.3 | 2.4 | 2.4 | 2.8 | | |
| | $D_{15\ \text{Riprap}}$ | 9.5 | 15.5 | - | - | - | - | - | - | - | 9 | | |
| | $D_{85}/D_{15}$ | 3.7 | 3.8 | | | | | | | | 3.2 | | |

# FIGURES

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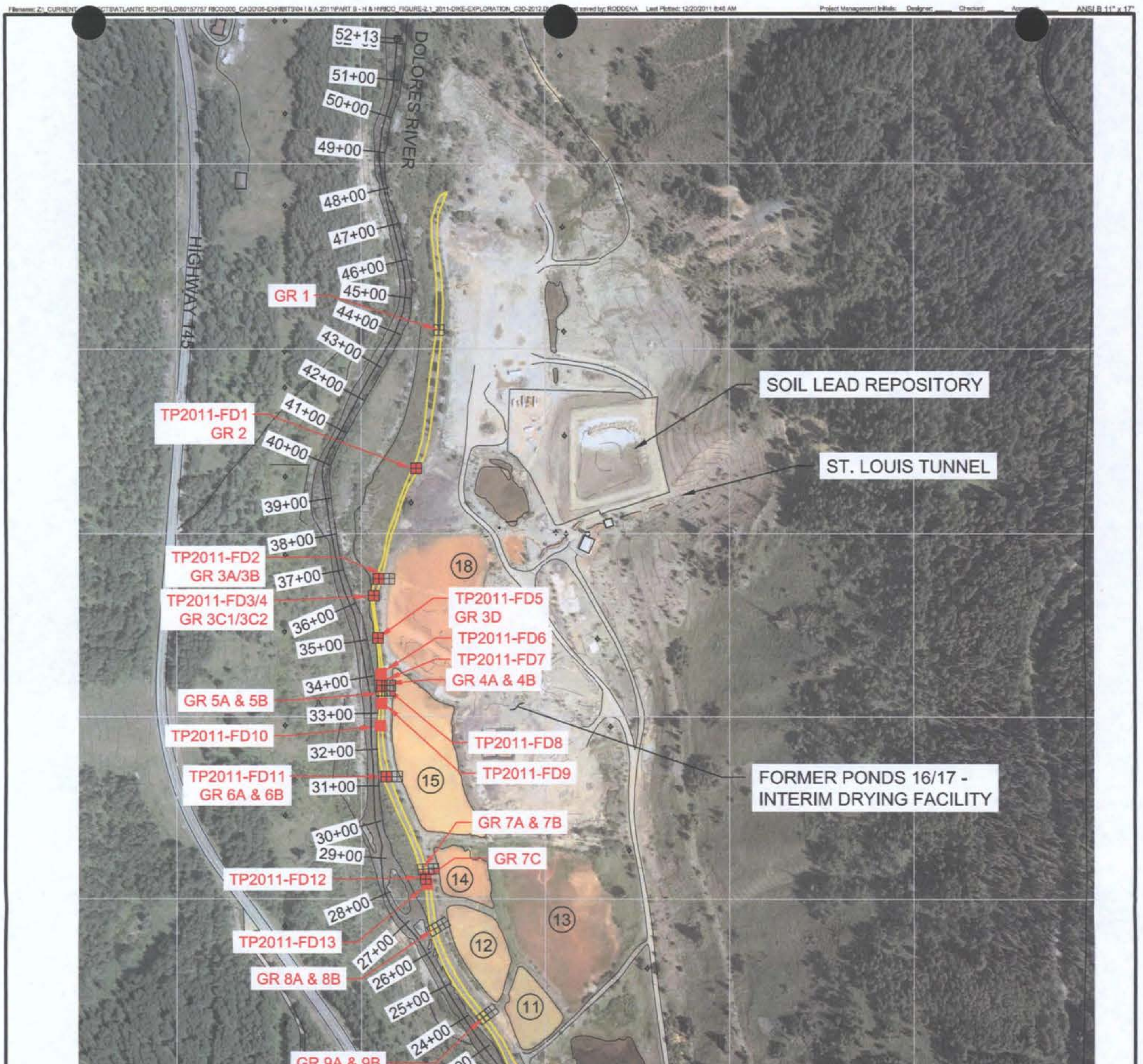

# RICO-ARGENTINE SITE-OU01

FLOOD DIKE SCOUR FIELD INVESTIGATION LOCATIONS

FIGURE 2.1

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Figure 4.1 – Critical section at station 46+61

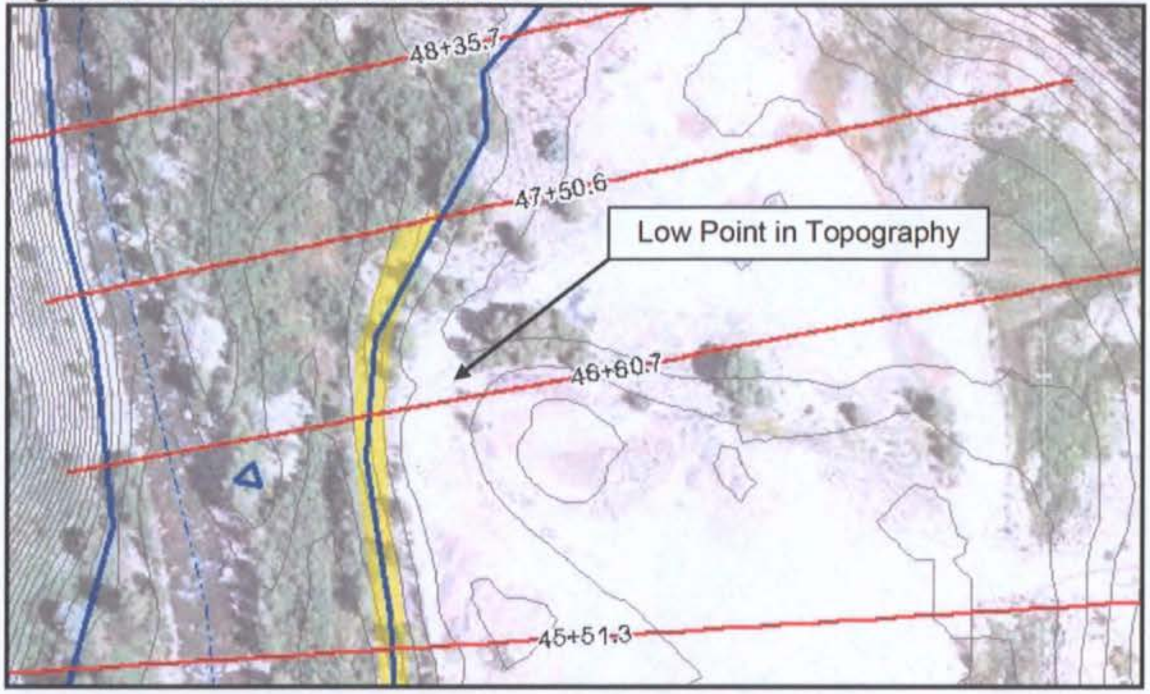


Figure 4.2 – Pond 18 Critical section at station 36+21

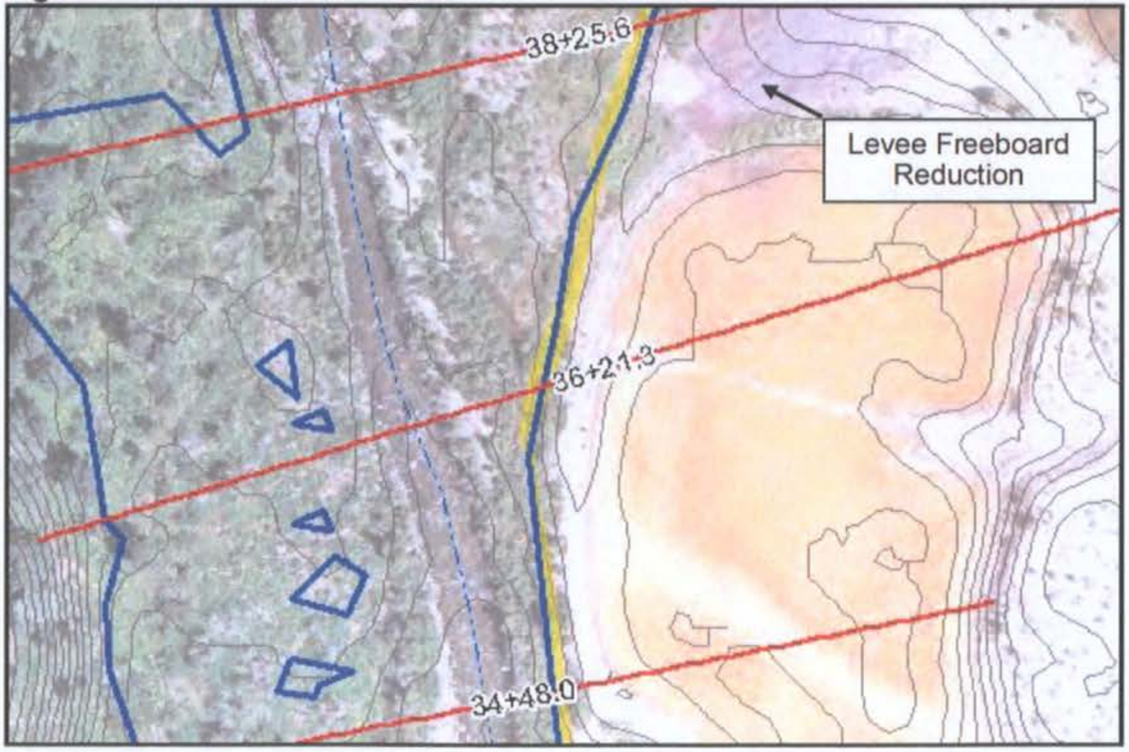


**Figure 4.3** – Pond 13 Critical section at station 24+65

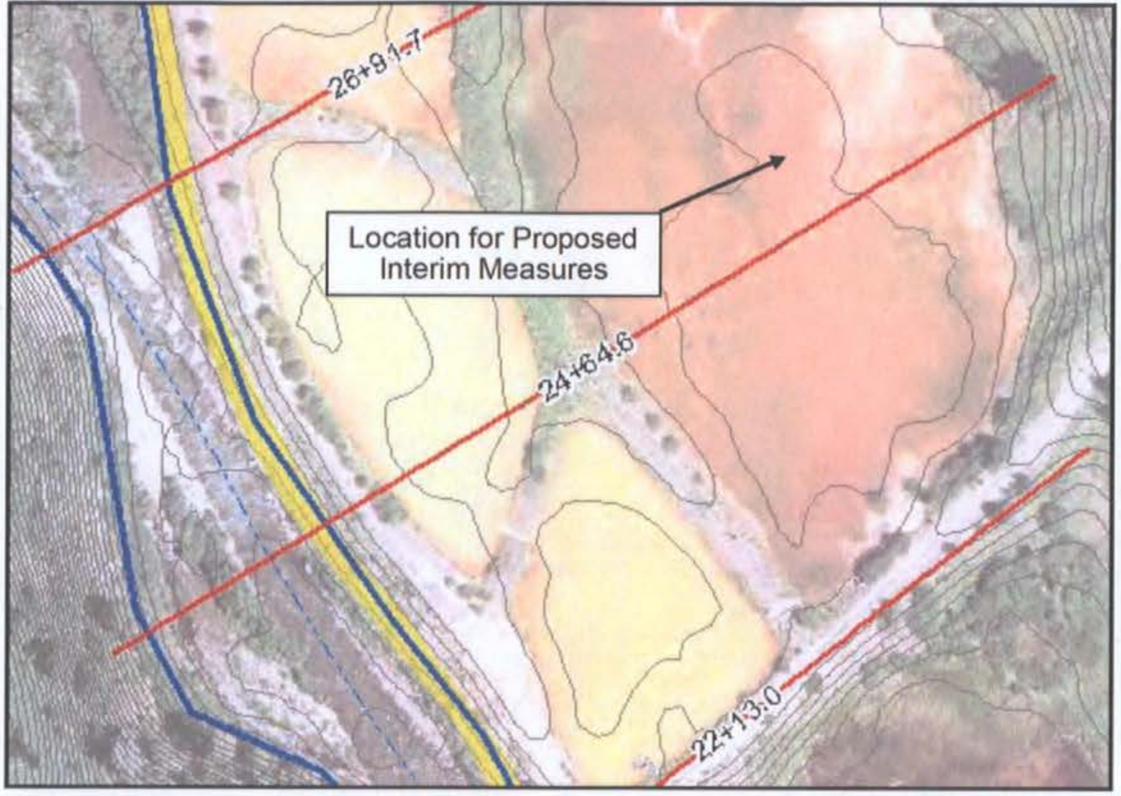


**Figure 4.4** – Pond 9 and 10 Critical section at station 20+45

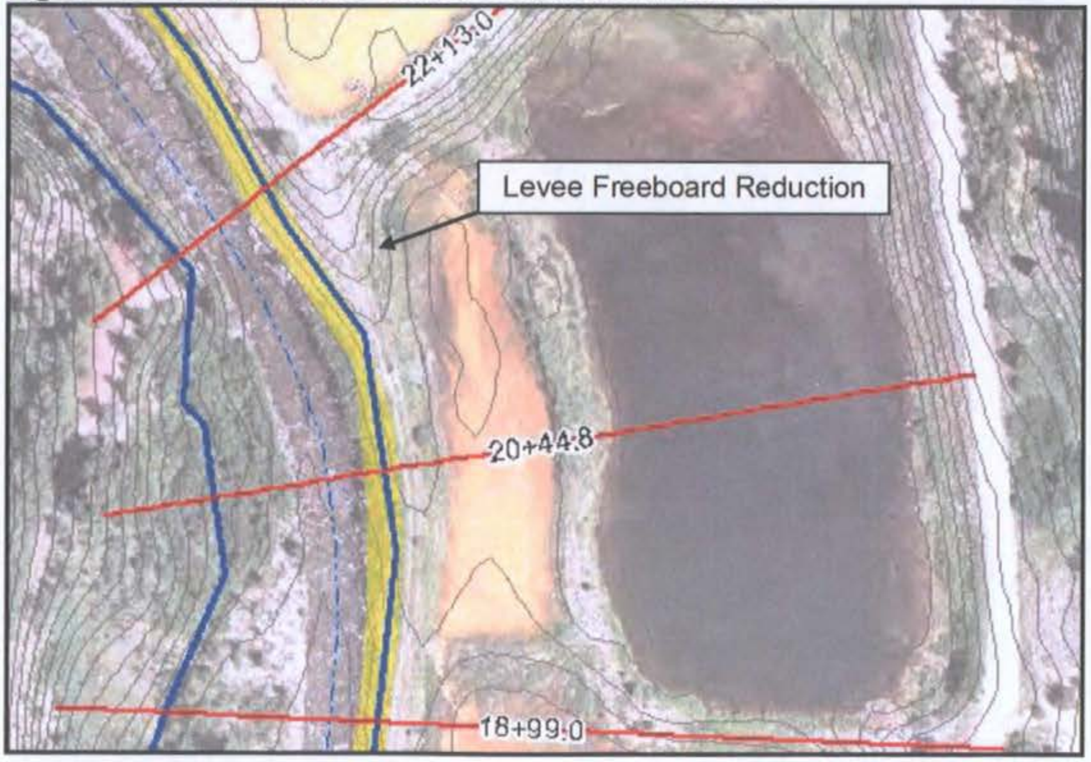
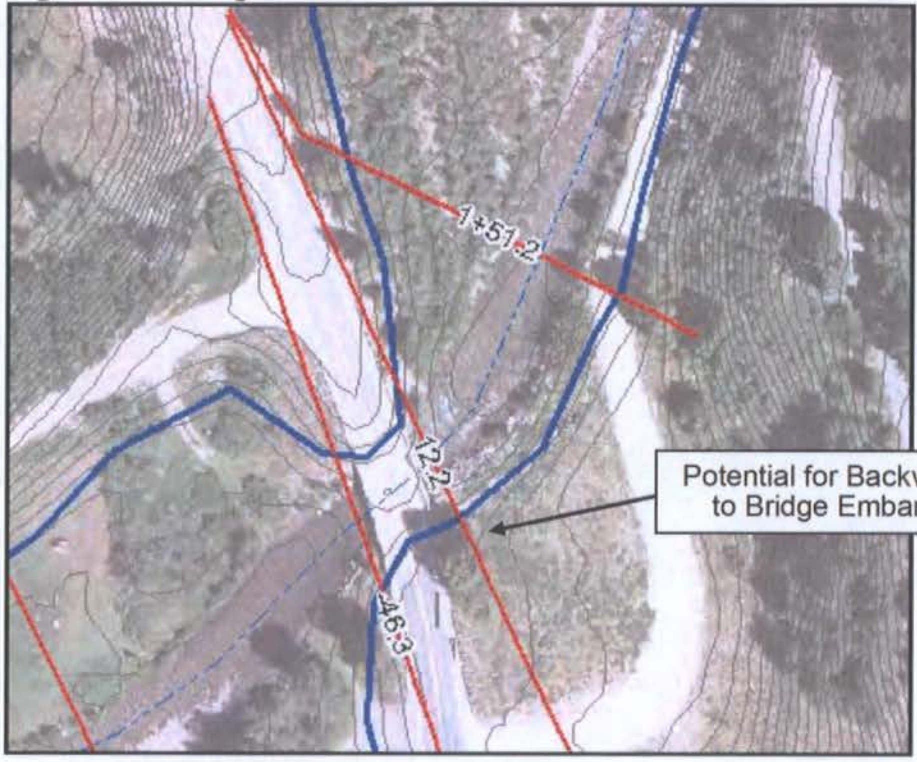
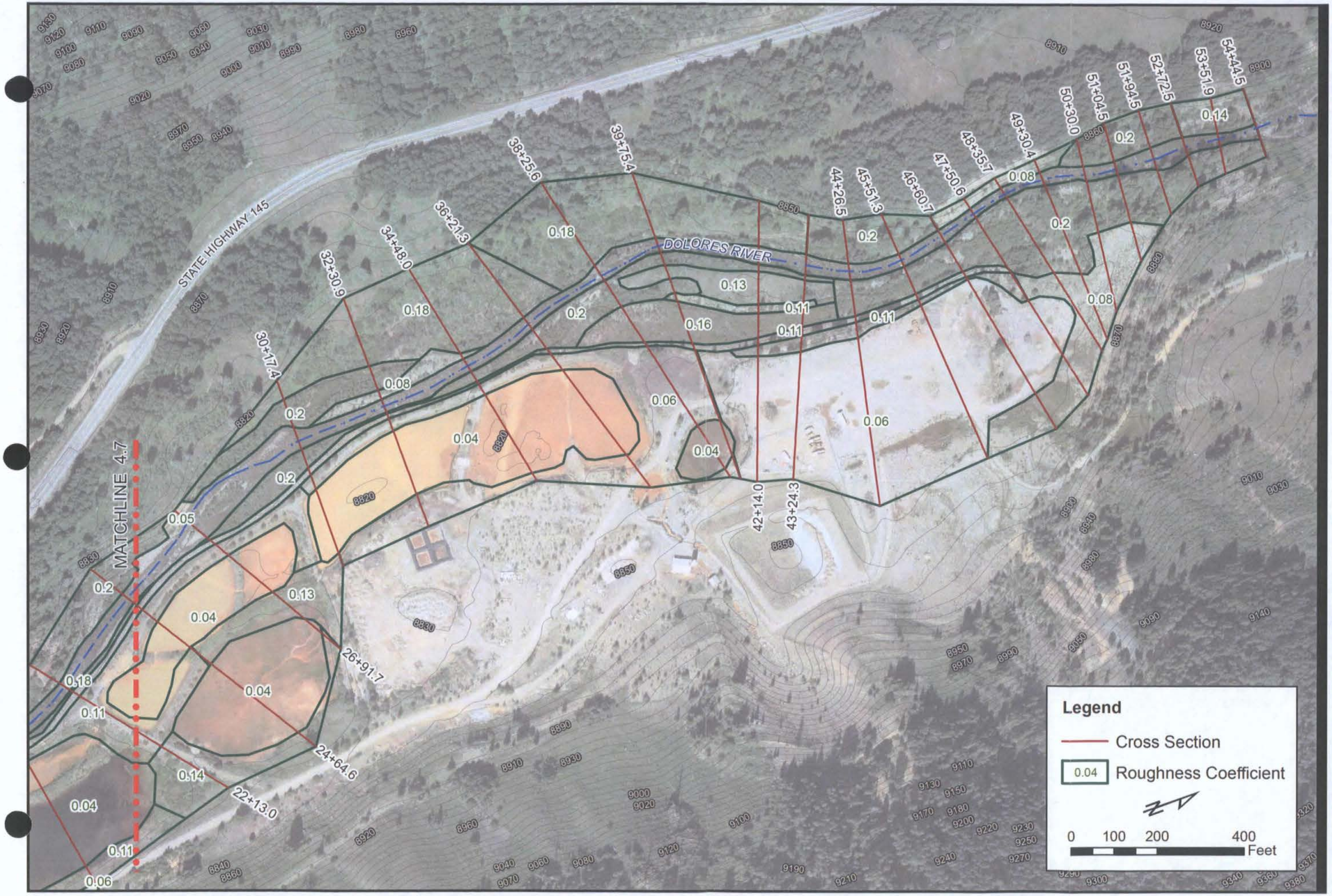


**Figure 4.5** – Bridge at station 0+12



Potential for Backwater due to Bridge Embankment



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## RICO-ARGENTINE SITE

DOLORES RIVER MANNINGS N

FIGURE 4.6

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# RICO-ARGENTINE SITE

DOLORES RIVER MANNINGS N

FIGURE 4.7

**Figure 4.8** – WSEL at Station 46+61

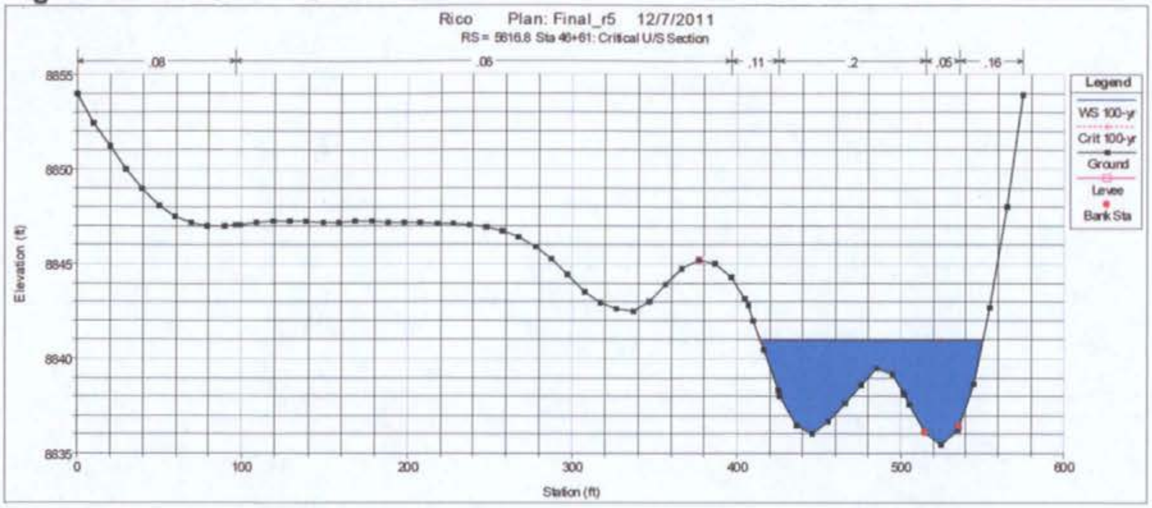


**Figure 4.9** – WSEL at Station 36+21

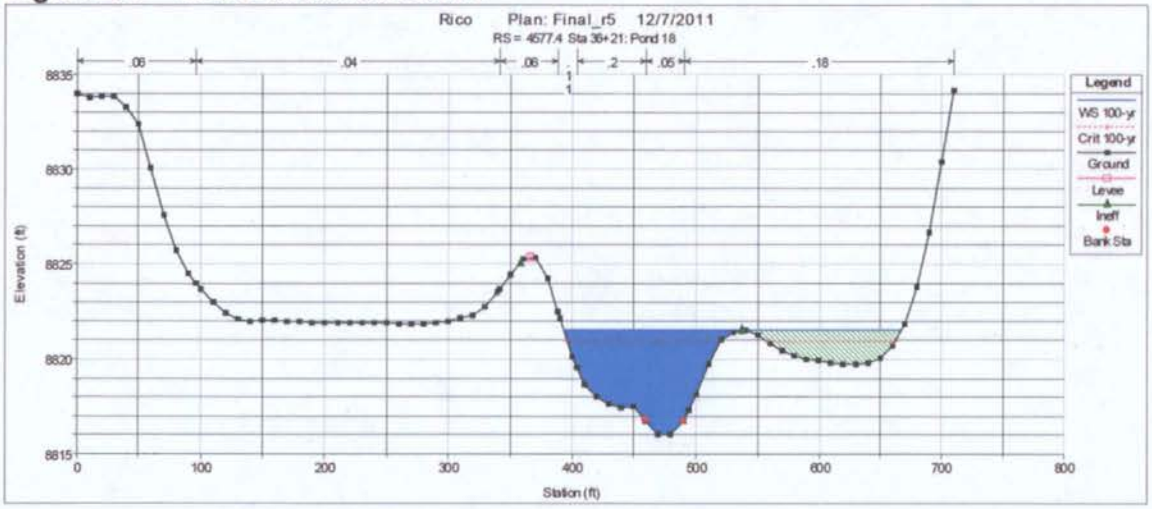


**Figure 4.10** – WSEL at Station 32+31

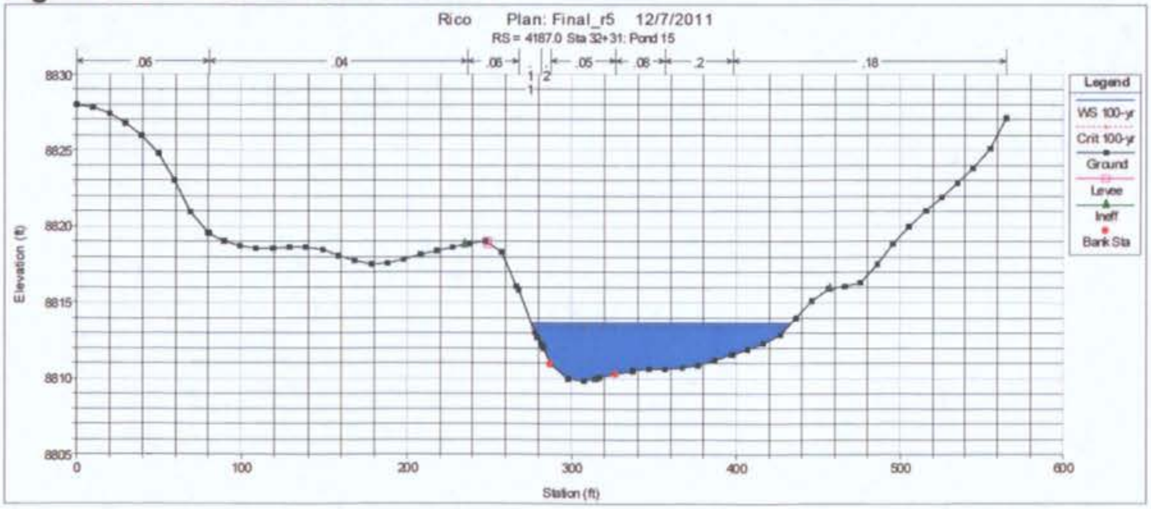


**Figure 4.11** – WSEL at Station 24+65

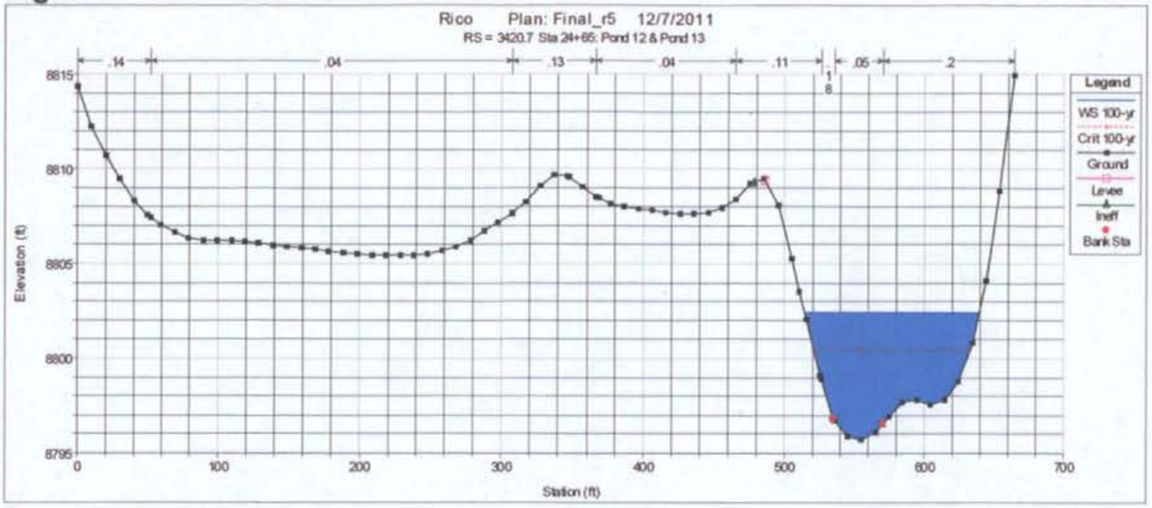


**Figure 4.12** – WSEL at Station 20+45

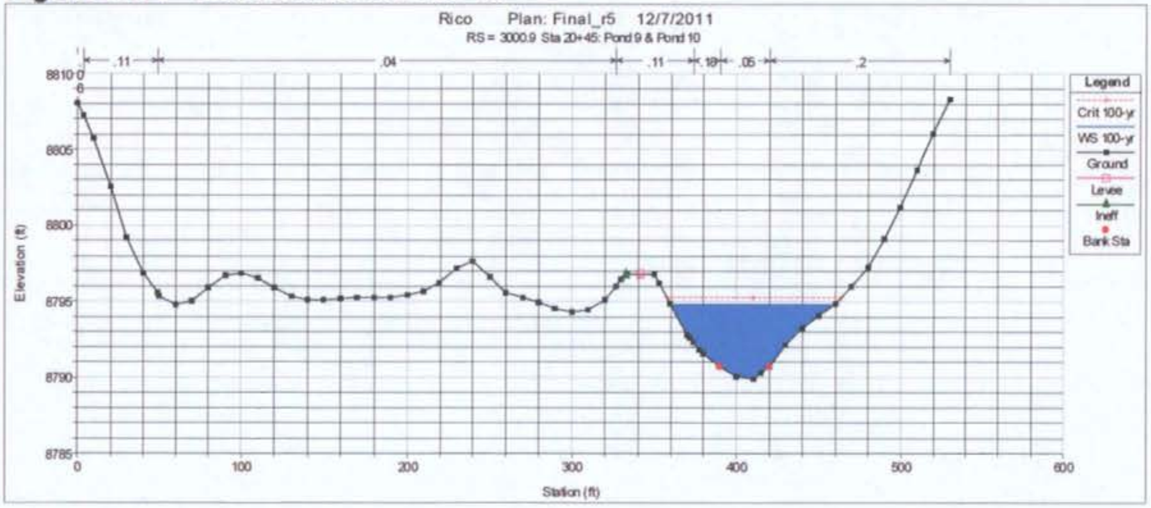


**Figure 4.13** – WSEL at Station 15+12

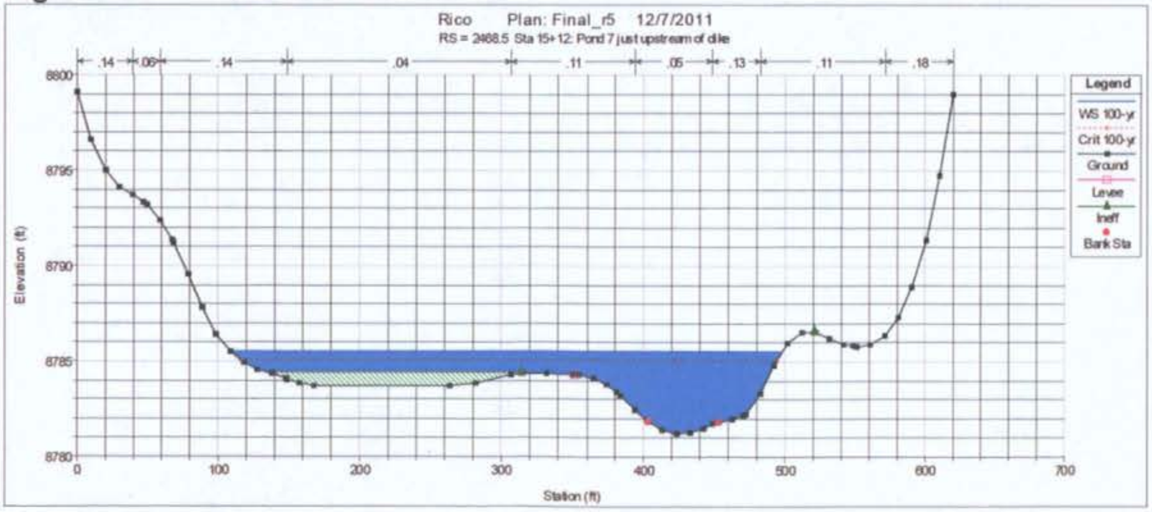
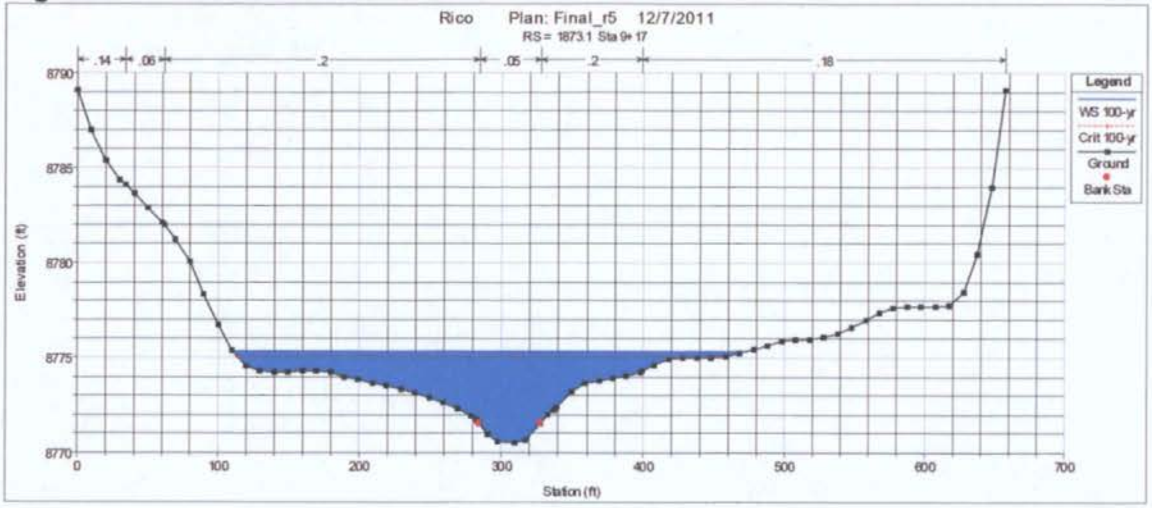
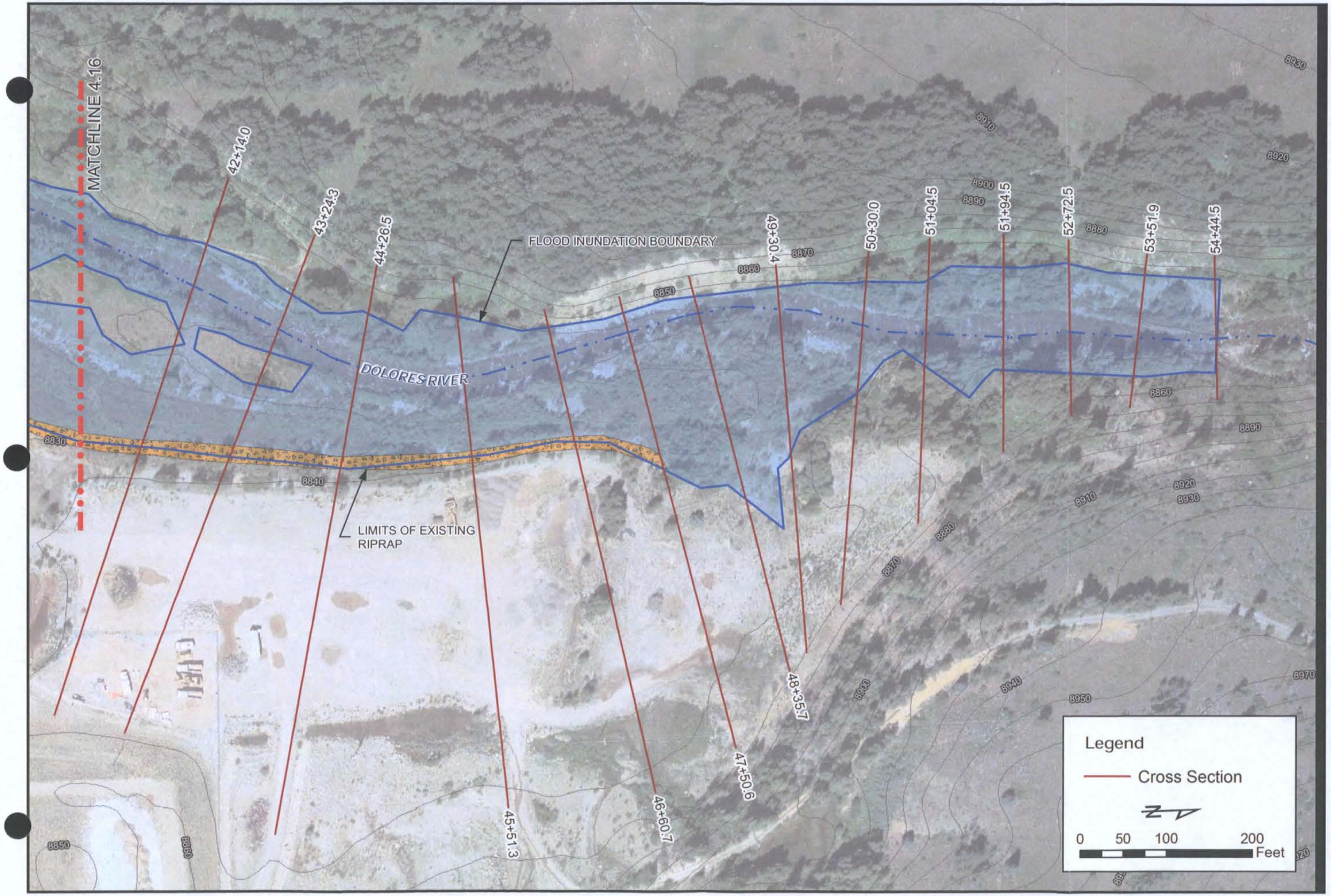


**Figure 4.14** – WSEL at Station 9+17





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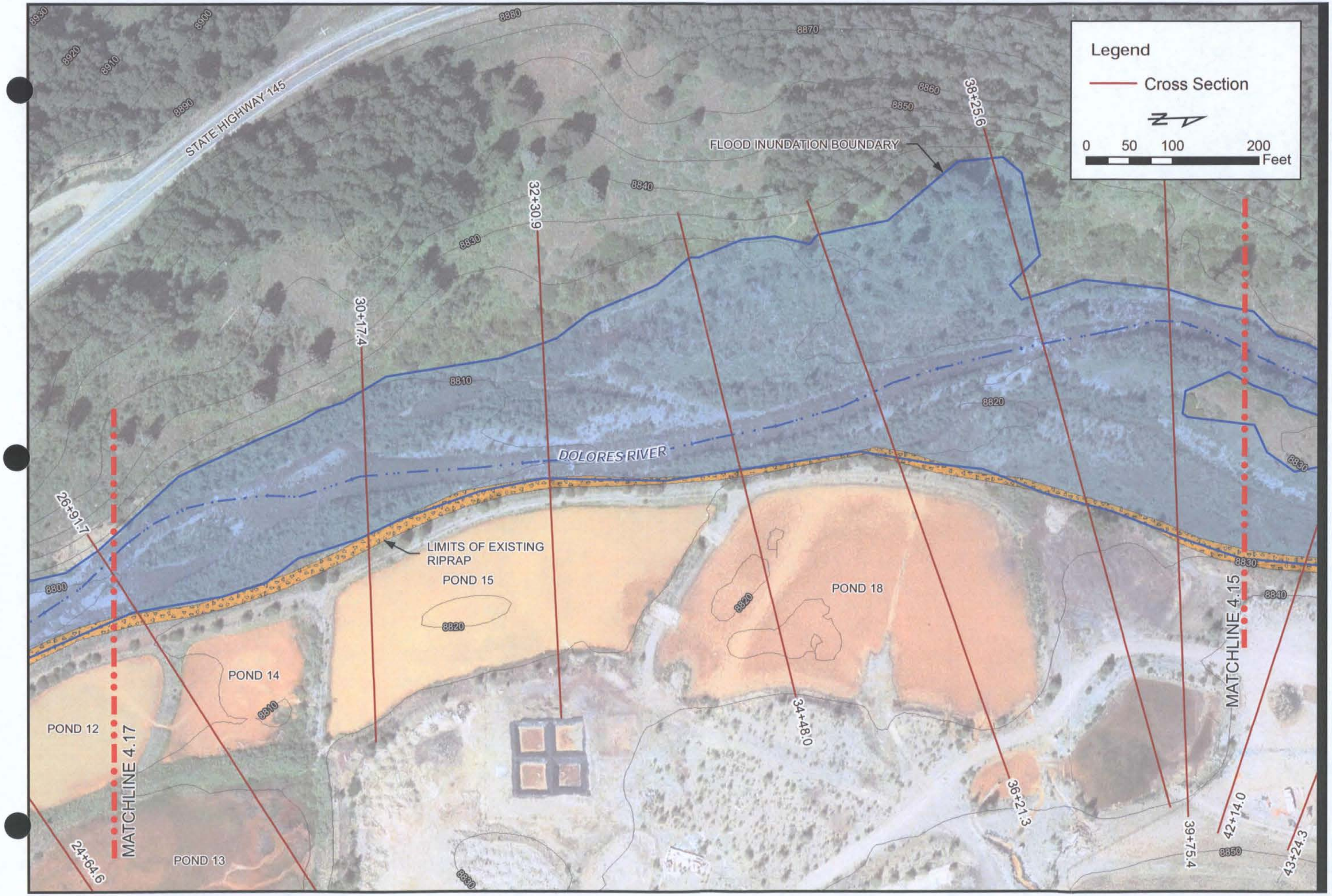
RICO-ARGENTINE SITE

DOLORES RIVER 100-YEAR FLOOD INUNDATION

FIGURE 4.15



# RICO-ARGENTINE SITE

DOLORES RIVER 100-YEAR FLOOD INUNDATION

FIGURE 4.16

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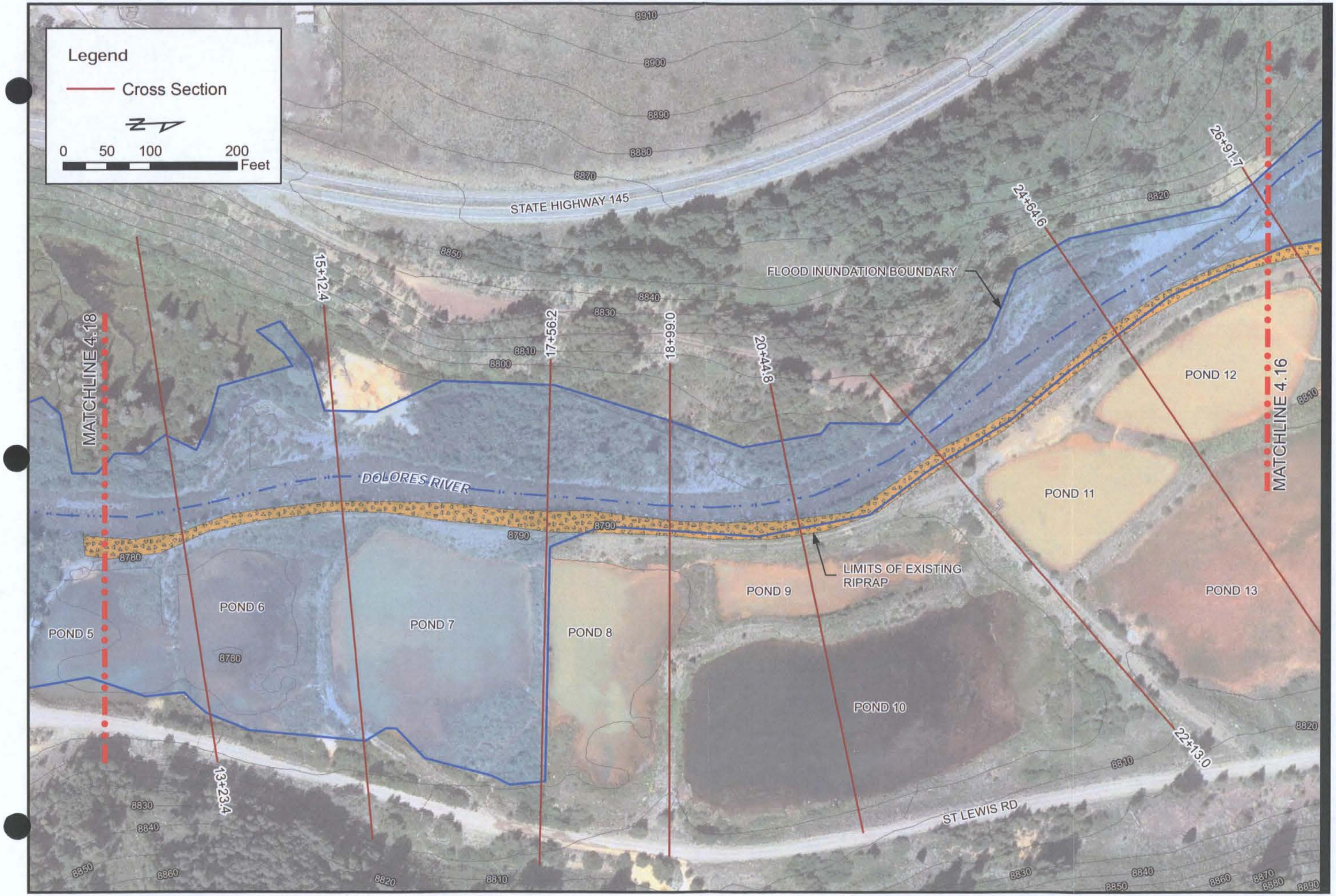

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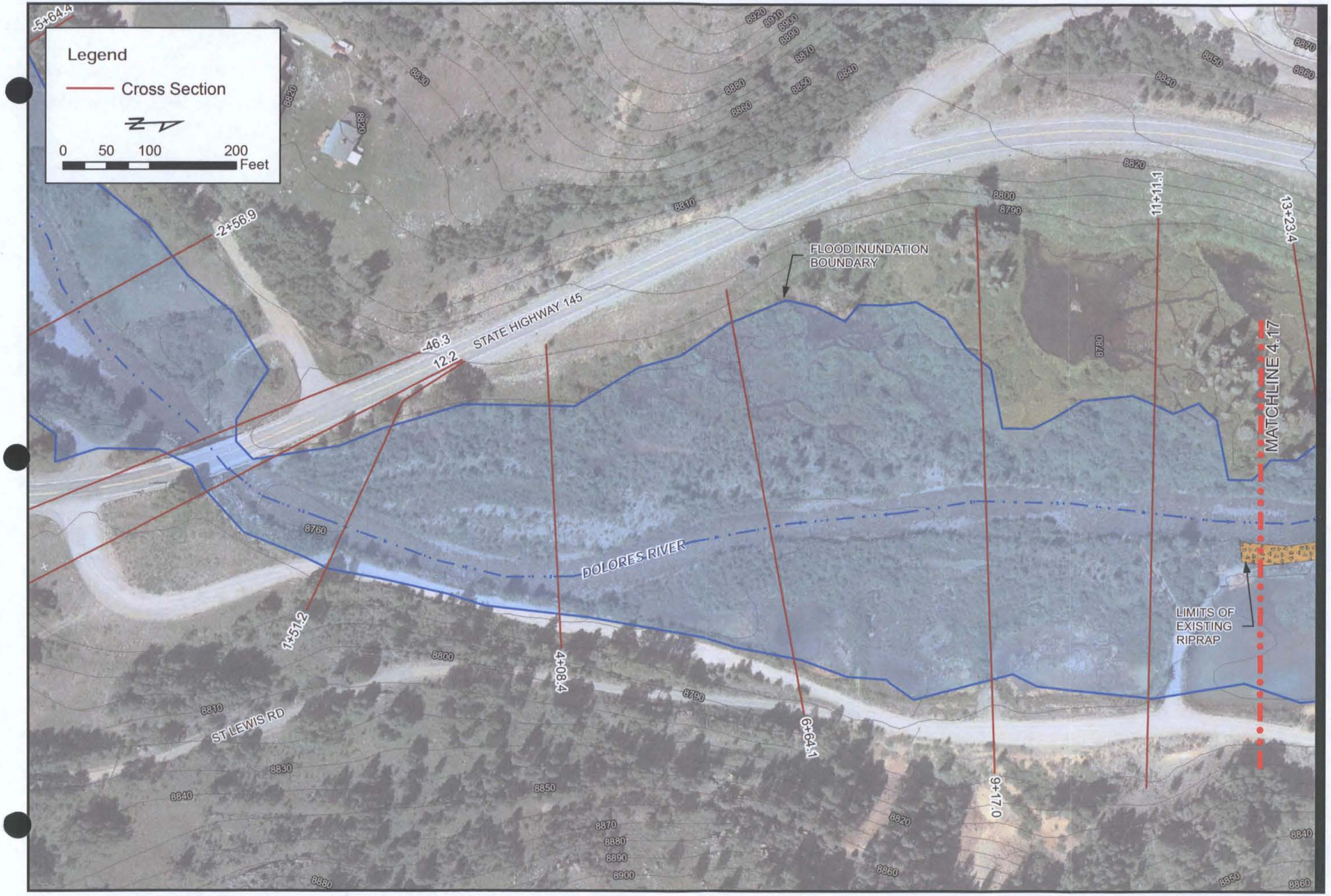
# RICO-ARGENTINE SITE

DOLORES RIVER 100- YEAR FLOOD INUNDATION

FIGURE 4.17



# RICO-ARGENTINE SITE

DOLORES RIVER 100-YEAR FLOOD INUNDATION

FIGURE 4.18

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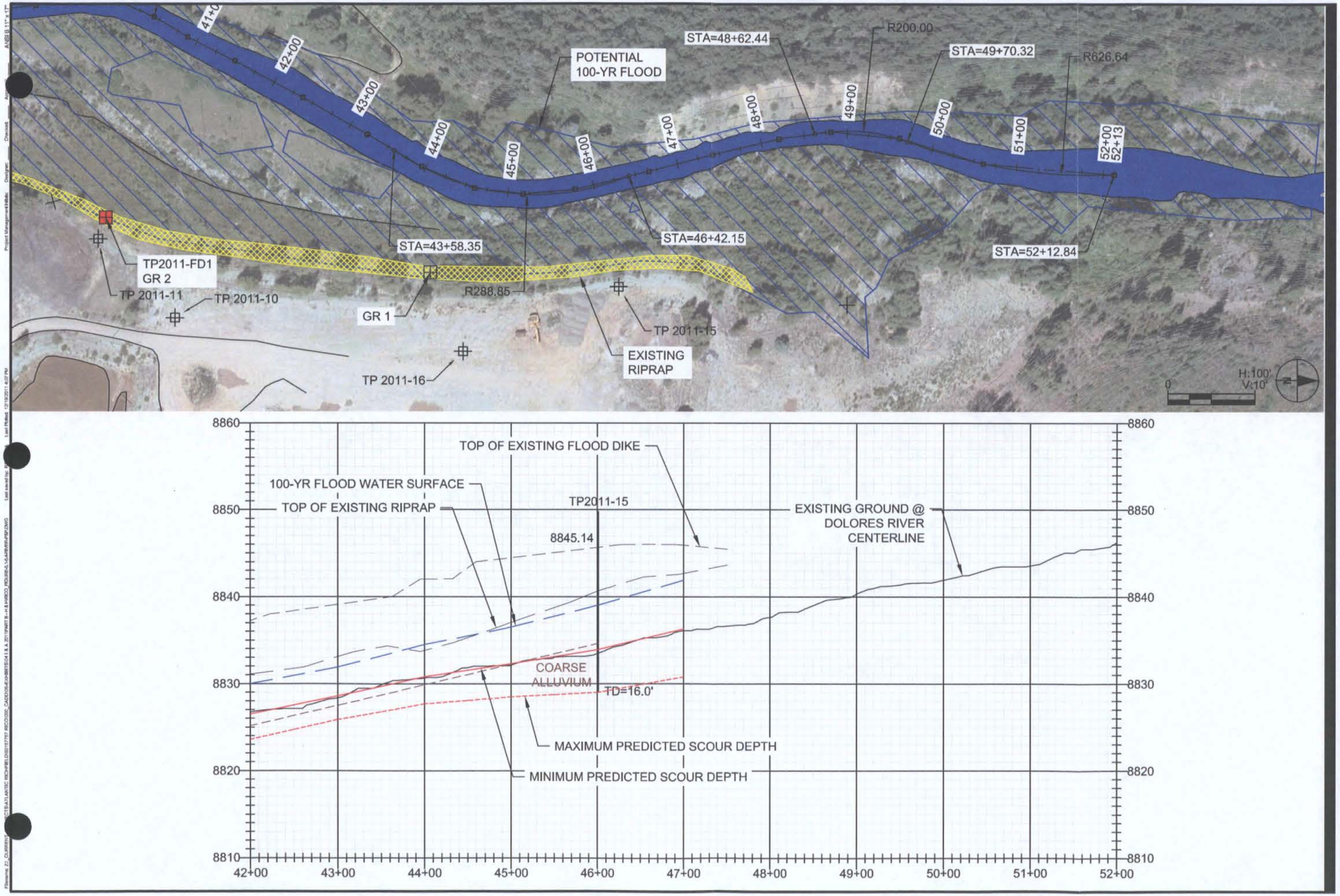

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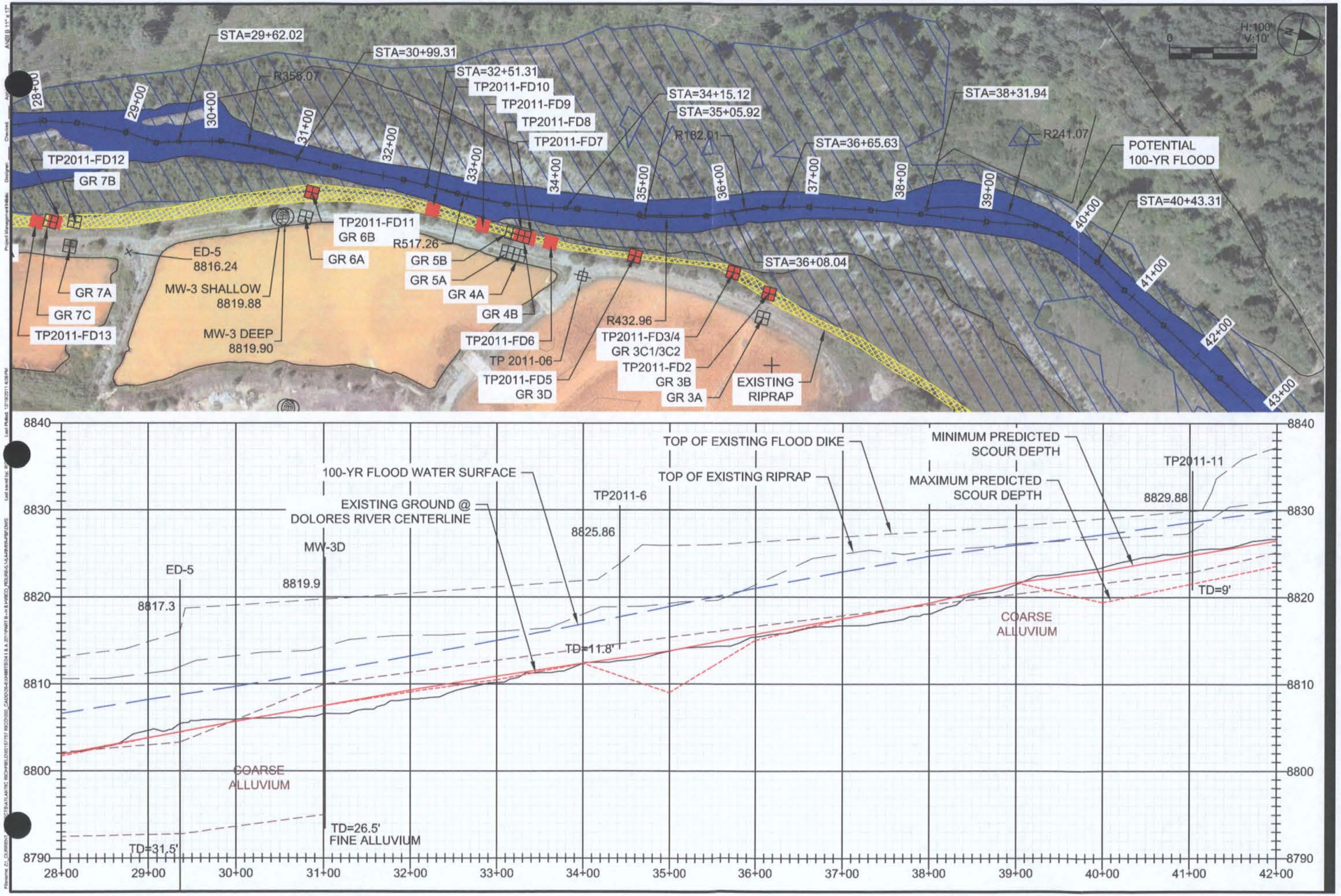
# RICO-ARGENTINE SITE-OU01

DOLORES RIVER PLAN & PROFILE

FIGURE 5.1



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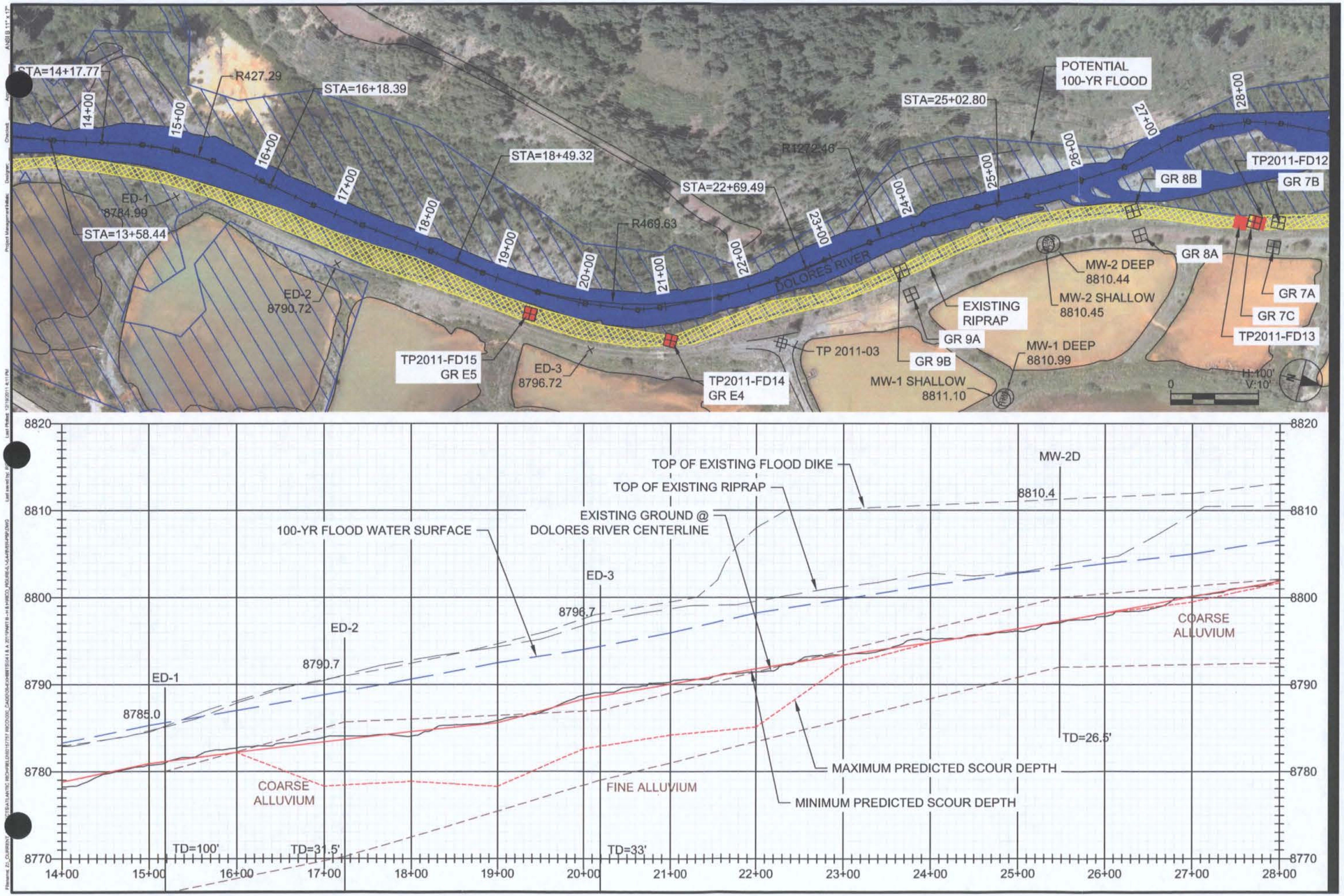
# RICO-ARGENTINE SITE-OU01

DOLORES RIVER PLAN & PROFILE

FIGURE 5.2



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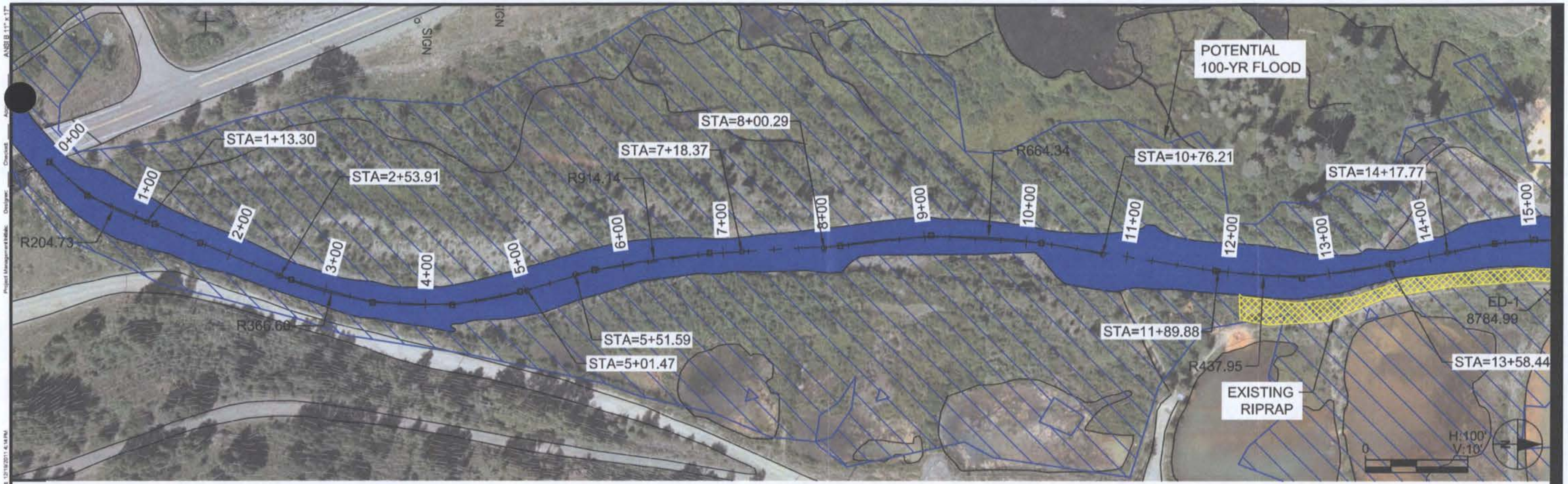
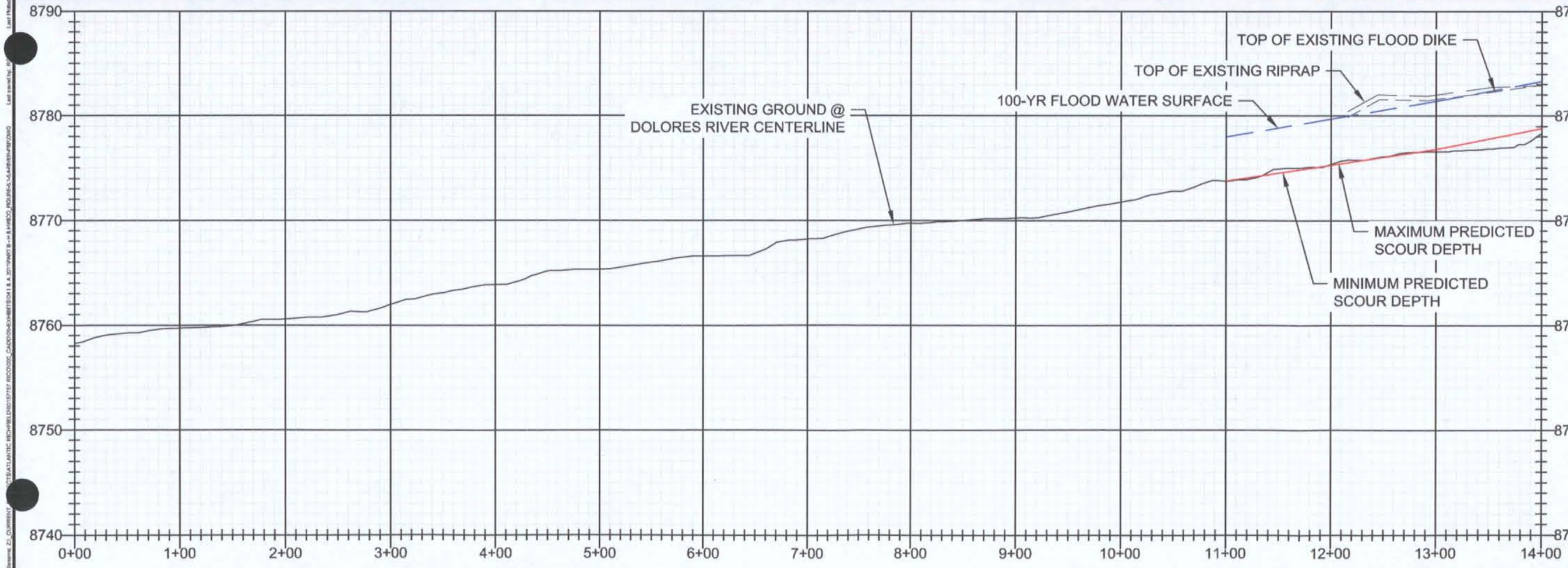
# RICO-ARGENTINE SITE-OU01

DOLORES RIVER PLAN & PROFILE

FIGURE 5.3





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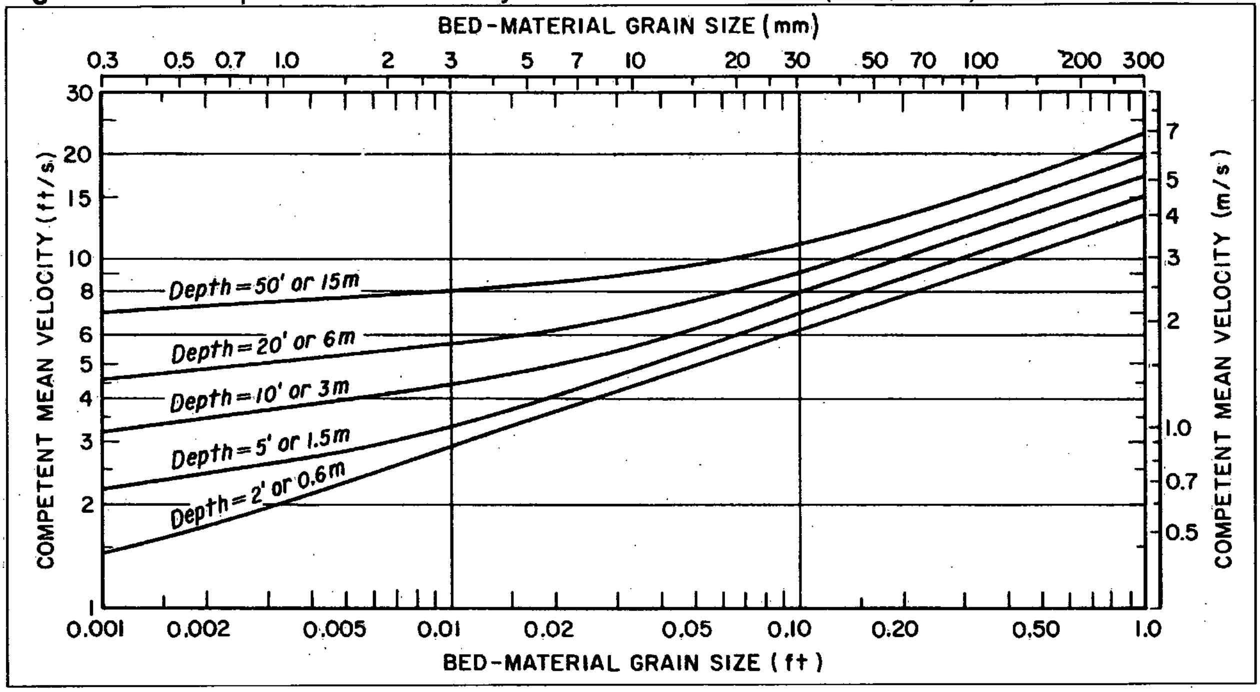
# RICO-ARGENTINE SITE-OU01

DOLORES RIVER PLAN & PROFILE

FIGURE 5.4

**Figure 5.5** – Competent Mean Velocity for Cohesionless Soils (Neill, 1973)



# PART D
# Adit and Portal Investigation Report

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# Appendices

Appendix D1 – Geochemical Laboratory Testing Results

# 1.0 Purpose and Scope

This Part D constitutes the Adit and Portal Investigation Report required under Subtask D1 of the Remedial Action Work Plan for the Rico-Argentine Mine Site and documents the work accomplished to date pursuant to the program of site investigations and laboratory testing in the approved *Investigation Plan for Collapsed Adit Area at St. Louis Tunnel* (referred to as the Adit Investigation Plan or AIP) (Atlantic Richfield Company, 2011). The location of the adit collapse area relative to the St. Louis Ponds portion of the Site is shown on Figure 1.1.

The primary objectives of the investigations as described in the AIP were to:

1. Investigate the condition of the collapsed portion of the adit and how it interfaces with competent rock at the brow of CHC Hill;

2. Assess the possible accumulation of settled solids and water build-up behind the existing blockage in the collapsed area; and

3. Provide information to support design of a hydraulic control system for discharges from the St. Louis Tunnel.

Investigations to support achieving these objectives are focused on collecting, controlling, and conveying the adit flow from its current point of discharge to the water treatment facility, currently assumed to be up gradient of the existing Pond 18.

As described herein, the investigations to date have provided important information addressing some key aspects of these primary objectives. However, as anticipated as possible in the AIP, additional investigations will be required to more fully support evaluation of access to and rehabilitation of the St. Louis Tunnel to a point where the tunnel encounters adequately competent bedrock (i.e., the brow of CHC Hill) or rock that can be improved to provide for an adequately stable hydraulic control structure.

As noted in the AIP, if consideration of temporary in-mine storage of currently discharging mine water to regulate seasonal flows is contemplated, then subsequent investigations would also need to address issues including the following:

1. The extent and location of available storage volume in the mine workings (i.e., open versus collapsed workings);

2. Potential for destabilizing existing colluvial, talus and landslide deposits blanketing the lower slopes of CHC Hill;

3. Potential for discharges through unconsolidated deposits, faults, fractures and joints, and/or unknown or inadequately sealed historic mine openings; and

4. Obtaining a better understanding of the hydrogeologic conditions and overall water balance within and conveyed through the underground workings.

5. Assessing these issues was beyond the scope of the initial investigations completed to date. The extent to which these issues should be addressed in additional investigations planned for 2012 will be discussed with EPA.

## 2.0 Ground Survey

The main objective of ground survey at the adit collapse area was to determine to the extent feasible the dimensions, alignment (i.e., bearing or azimuth) and grade of the accessible portion of the tunnel. It was reasoned that this information might provide a check on the tunnel bearing reported by McKnight (1974) and the tunnel grade calculated from a portal invert reported by McKnight (1974) and a spot elevation on a historic mine map of the St. Louis Tunnel. The historic and new survey data was intended to provide the basis on which bearing (azimuth) and inclination of borings would be set to attempt to intersect the tunnel as discussed in Section 4.2.

A site reconnaissance of the portion of the St. Louis Tunnel exposed in the U-shaped excavation behind the remaining portal structure (i.e., the adit collapse area) was conducted. Based on this reconnaissance, it was determined that surveying of the tops of timber "pillars" that were key elements of the tunnel support in this reach and that appeared to still be in their original position would provide the most potentially reliable basis for the projection. Surveys were conducted utilizing conventional total station equipment and techniques. Appropriate safety precautions were implemented to protect the survey crews when working near the collapsed tunnel.

Figure 2.1 shows the key data acquired from the ground survey and an interpreted "best fit" bearing (or azimuth) of the tunnel based on that data. The nominal grade calculated by averaging the top elevations of selected apparently in-place timber posts was 0.9 percent. This is very close to the typical grade constructed in mines of this type and era of about one (1) percent. However, the reliability of this estimate of tunnel grade was judged potentially suspect due to the inherent variability of the ground at the tunnel support post locations (and thus likely variable length of the posts) and the potential that the posts had settled differentially over time under the prior load of colluvium over the tunnel roof. As a result, the bearing from the new surveys and the tunnel grade from the historic data were utilized in the calculations of drill hole bearing and inclination.

## 3.0 Engineering Geologic Mapping

A preliminary interpretation of the geologic conditions in the vicinity of the St. Louis Tunnel portal and adit collapse area is shown in Figure 3.1 which is a portion of the overall preliminary site geologic mapping described in Section 3.0 of Part A. This interpretation is based on surface geologic mapping of the slope conditions located upslope and in the vicinity of the tunnel alignment and the borehole intercepts encountered in drill hole BAH-01. An area of bedrock consisting of the Lower Hermosa Formation was mapped during field reconnaissance several hundred feet upslope of the tunnel portal area. The bedrock area consists of a bedded sequence of sandstone and siltstone defined by both outcrops and subcrops (areas where the material has broken off or derived from in-place outcrops but probably not moved more than a few feet from its original location) and therefore marks the approximate location of intact bedrock at the ground surface above the tunnel.

There is also a small localized active landslide located in the slope above the collapsed tunnel entrance area. The surface expression of the slide suggests that it is shallow (<10 feet) and has not moved in the past several years. The reminder of the area located above the adit collapse area is covered by coarse colluvial material containing abundant boulder size blocks of displaced bedrock.

## 4.0 Exploratory Test Pitting and Drilling

An initial program of test pitting and drilling was implemented at the adit collapse area as described herein. Although different in detail than the program originally envisioned in the AIP, the objectives of the AIP were met with the revised program. The primary differences in the program implemented from that planned were:

1. Drilling in the bottom of the adit collapse area was performed with a direct rotary skid-mounted drill rig rather than with an air-track rig;
2. Only one drill hole was completed from within the excavated collapse area rather than the linear array of four (4) air-track holes originally planned;
3. The "horizontal drill hole" was relocated to result in a shorter hole from collar to projected target location at the tunnel, and the hole was inclined down rather than up from the collar to the tunnel;
4. One of the proposed test pit locations was not accessed due to concerns for worker safety related to rocks dislodging from the steep excavated slope in the collapse area; and
5. The resistivity surveys were not implemented.

The decision to drill only one hole in the bottom of the collapse area was based primarily on concerns with the safety of the drill crew and logger related to large rocks becoming dislodged from the steep excavation slopes especially following precipitation events (rain or wet snow). Also, significant challenges were encountered in accessing the potential drill sites in this area, and in setting the rig in a manner to keep the drill string on the planned alignment given the inherently unstable bouldery ground conditions.

The decision to utilize a direct rotary drill rig with capability for tricone drilling through the coarse colluvium and then for core drilling if or when rock was encountered was determined to provide a better opportunity to acquire useful information than an air-track drill without sampling capability.

As discussed in Section 4.2, the single drill hole completed (AT-2) provided very important and useful information and justified the approach implemented. The decision to relocate the "horizontal drill hole" to result in a shorter distance to the targeted location on the projected tunnel alignment was based on the experience gained in drilling AT-2 and the judgement of the drill crew and loggers that a shorter, more steeply inclined boring would be more likely to stay approximately on the planned alignment and would provide a better opportunity to deploy sampling and remote sensing equipment down the hole should the tunnel be intersected. Again, this decision was justified by the success in having intersected the tunnel and installing casing in the hole that will provide the opportunity for sampling, remote sensing and installation of a transducer in the tunnel during the 2012 field season.

As noted previously, protection of staff performing the site investigation work from rock impact was a paramount concern especially at the bottom of the excavation over the collapsed adit. This drove the decision to eliminate the one planned test pit that was in a particularly vulnerable location that was not amenable to protecting to the degree feasible at the other locations that were sampled.

Finally, it was determined that the resistivity surveys, especially the line proposed higher on the excavated slope in the collapse area, did not hold enough promise of being able to detect the tunnel to justify the risk, time and expense to perform this work. It was apparent with the success achieved in intersecting the tunnel with two drill holes that the historic information and survey data acquired in this investigation provided an adequate basis for projecting the location of the tunnel in the reach targeted for this study without the additional information originally intended to be acquired from the resistivity surveys.

## 4.1 Test Pitting

A total of five (5) test pits were hand dug at the locations shown on Figure 3.1 to acquire representative bulk samples of the colluvium supporting the existing steep and metastable slopes of the excavation in the collapsed adit area. In addition to acquiring samples for laboratory testing as described in Section 5.1, the in situ density and moisture content of the colluvium was measured utilizing a nuclear density gage at four (4) of the test pit locations (TP-1, TP-2, TP-5 and TP-6). These results confirm that the colluvium in the steep excavation slopes is loose (relative compaction in the range of only 73-88 percent) and subject to instability especially following precipitation events.

## 4.2 Drilling

Two drill holes were completed as part of the initial investigations at the adit collapse area as noted previously. The following subsections provide detailed descriptions of the means and methods utilized, drilling conditions encountered and overcome, materials penetrated and samples acquired in these drill holes.

### 4.2.1 Drill Hole AT-2

Drill hole AT-2 was originally planned to be drilled using an air-track rig and the designation of "AT" was retained when the decision was made to drill with a direct mud rotary coring rig instead as discussed above. The final location selected for this drill hole was in the vicinity of the originally planned AT-2; there was not a drill hole AT-1.

A drilling platform for drill hole AT-2 was constructed by Flare Construction on October 15 through 16, 2011 at the base of the cut slope located above the collapsed portion of the St. Louis Tunnel (Photo 4.1). The drill hole was located upgradient from where mine water discharge daylights (at elevation 8,865.0 feet) from the collapsed portion of the tunnel. The drilling platform was approximately 40 feet long by 20 feet wide. Seven two-foot wide by five-foot long concrete retaining wall blocks were stacked on the upslope side of the drilling platform as a precaution to prevent potential rolling rocks from impacting the drilling platform (Photo 4.2). The skid-mounted Longyear 45 core drilling rig was positioned on the drilling platform using a D6 dozer. The calculated angle from the surveyed boring location to the adit assumed a 1.27 percent grade of the tunnel floor based on historic published and unpublished information as noted in Section 2.0. The drilling rig clutch which controls the angle of the HWT drill casing was set at -32°.

Drill hole AT-2 was drilled between October 18 and 21, 2011. The drilling commenced at 1500 hours on October 18, 2011 using HWT casing and a tricone rock bit (Photo 4.3). Water was used to lubricate the rock bit; due to the short run to the tunnel, the driller opted not to use drilling mud. A copy of the boring log for AT-2 is included in Appendix A1 in Part A of this report. Key drilling observations and procedures are summarized below; the depth intervals indicated are from ground surface down along the angled drill hole:

- 10/18/2011, Time 1500 hrs. From ground surface to a depth of 13 feet was colluvium with some boulders.
- 10/18/2011, Time 1545 hrs. From 13 feet to 16 feet was a void or very loose material, drill stem advanced with no additional down pressure. Encountered boulders from 16 feet to 19 feet.
- 10/18/2011, Time 1600 hrs. Encountered tunnel at depth of 19 feet at an angle of -32° from horizontal. The tunnel water turned a rusty orange-brown color at the same time the drill casing entered the tunnel (Photo 4.4).
- 10/18/2011, Time 1620. From 19 feet to 26.5 feet the drill casing advanced through the tunnel with very little down pressure. A total of 7.5 feet of open tunnel was encountered. Advanced the drill to a depth of 26.5 feet and drilled into rock less than 0.5 feet. The driller thought this was bedrock given the nature of the vibration of the drill rig. Ended drilling for day at 1715 hrs.
- 10/19/2011, Time 1030. Drill rig did not start due to grounding wire that needed to be repaired. Removed the HWT casing to switch to HQ coring. The HWT casing was tooled with a core bit and installed back down the same hole into and through the tunnel to a depth of 26.5 feet. A diamond core bit attached to HQ casing was inserted into the HWT casing to total depth of 26.5 feet. Tunnel water ran a rusty orange brown color right after the drill stem entered the tunnel. A 10-foot core barrel was attached to the wireline and lowered to the total depth. Coring commenced at 1139 hrs.
- 10/19/2011, Time 1157. At approximately 1157 hrs the drill rig moved about 3 inches. This caused alignment problems with the drill casing. The drill rig was realigned and anchored using the weight of the D6 dozer parked behind the drill rig.
- 10/19/2011, Time 1630 hrs. Removed the inner 10-foot core barrel using the wire line. There was no core in the barrel, and the coring bit was completely destroyed; having been ground down to just metal with no diamond bit visible. Driller thought only thing that could cause this kind of damage was drilling through metal. Ceased drilling operations for the day. The depth to water in the HWT casing was measured with an electronic water level meter. The depth to water below the top of casing at a -32° angle was 9.25 feet. Using the equation sin32° x 9.25 feet gives the vertical distance to water below the ground surface of 4.9 feet. Using an inclinometer and line of sight, the head of the water in the adit at boring AT-2 was approximately three (3) feet higher than the water surface where it emerges from the collapsed tunnel. A

small submersible pump was lowered down the HWT casing and into the mine tunnel. The pump was a 1.75-inch diameter 12-volt submersible pump connected with ½-inch polyethylene tubing to convey the water to the surface. Initially, the water pumped from the tunnel was slightly gray with a faint green tint, very similar to the color of the water commonly observed emerging from the collapsed tunnel. The water then changed to orange-brown rust color. At this point, the pumping efficiency decreased and the discharge was very viscous, and the higher viscosity material appeared to be a precipitate (Photo 4.5). A sample was pumped to a plastic bottle and allowed to settle. The water and precipitate separated, with the precipitate on the bottom of the plastic bottle.

- 10/20/2011, Time 1038 hrs. New HQ coring bit is inserted down the HWT casing to total depth of approximately 27 feet.
- 10/20/2011, Time 1243 hrs. Cored to a total depth of 35 feet. Removed inner core barrel and recovered approximately two feet of material. The core consisted of (from shallow to deep) metal railroad track, railroad tie wood, and six inches of latite porphyry (Photo 4.6).
- 10/20/2011, Time 1420 hrs. Finished removing wood from inner core barrel. Postulate that the wood jammed inside core barrel tripped the overshot latching lever on the wireline and the inner core barrel moved up the HQ casing, thereby not allowing the rock core to be captured in the inner core barrel. The inner core barrel was not locked into place at the HQ shoe. The HQ coring bit continued to core, and there was potentially a seven (7) foot section of core in the HQ casing. A visible offset of a land slump was noted above the drilling area, and work was stopped for the day to evaluate the slump.
- 10/21/2011, Time 0800 hrs. Decision is made to move drill rig from AT-2 location. At 1030 the HQ casing was removed from the HWT casing and checked for the presence of a residual core but none was found. At 1030 the drill rig was moved using the D6 dozer.
- 10/28/2011, Time 1500 hrs. Constructed a modified coliwasa sampler using a weighted polyethylene bailer and 26 feet of ¾-inch PVC pipe. The top of the bailer was cut off and attached to the PVC pipe using stainless steel screws and duck tape. Assumed the ball in the bottom of the bailer would set sufficiently to recover the stratified water and apparent precipitate. Three samples were collected at depths of 24.5, 26 and 26.3 feet (as measured down along the inclined casing) below top of casing (Photo 4.7). The relatively clear water and apparent precipitate below the water surface is visible in all three samples.

The tunnel appears to be open at location AT-2 based on the 6.5 feet of void encountered during drilling. The tunnel also appears to be partially filled with an orange-brown rust colored material that is slightly denser than water that is inferred to be primarily metal oxy-hydroxide precipitate ("red dog"). A down hole video log of AT-2 completed on November 3, 2011 shows the apparent precipitate; a copy of the video file will be provided to EPA under separate cover. It is unknown if the seven (7) feet of core that was lost during the drilling of AT-2 was competent bedrock. Drill hole AT-2 was left as a cased hole that can be accessed for future downhole surveys, sampling and monitoring of water levels. A transducer was installed and water head measurements are being recorded and periodically downloaded from an on-site data collector.

Water levels measured at the time of drilling indicated that the head in the tunnel at the location of drill hole AT-2 was approximately nine (9) feet above the tunnel floor. Assuming that the tunnel height is likely something less than nine (9) feet but probably at least seven (7) feet (based on a note on a figure in McKnight (1974) that a bedding attitude was taken seven (7) feet up the tunnel wall), this would mean that at least the lower reach of the St. Louis Tunnel is slightly pressurized. As noted previously, it is apparent that water is backing up behind what is inferred to be a "leaky" plug of colluvial and tunnel support debris with approximately three (3) feet of head loss from AT-2 to the point of discharge of mine water from the debris. If the tunnel is assumed to be nominally eight (8) by eight (8) feet square, and the invert grade is assumed to be in the range of 0.9-1.27 percent, the water would be estimated to back up on the order of 700-1000 feet into the St. Louis Tunnel upgradient of the blockage. The volume of water backed up may be on the order of 200,000-300,000 gallons (or 0.6-0.9 acre-feet).

### 4.2.2 Drill Hole BAH-01

The down-gradient portion of the St. Louis Tunnel just above the original tunnel entrance (at the still existing portal structure) has collapsed and is covered by colluvial material. Drill hole BAH-01 was drilled to investigate the thickness of the colluvial material and location of the buried bedrock surface in the vicinity of the St. Louis Tunnel alignment. The boring was also oriented to attempt to intercept the St. Louis Tunnel.

The location of BAH-01 and orientation of the drill hole in relation to the St. Louis Tunnel alignment is illustrated on Figure 3.1. The drill collar for BAH-01 was located on a bench cut by Flare Construction into a west facing slope situated south of the St. Louis Tunnel collapsed adit area (Photo 4.8). Drilling was accomplished using a skid mounted Longyear 44 diamond core rig using rotary wash methods (Photo 4.9). To target the tunnel, the boring was set up to drill at a bearing of N38.94°E and -13.5° inclination (from horizontal) (Photo 4.10). The angle of the drill rods at the conclusion of the drilling was measured at -15°. Drilling commenced on October 26 and was completed on November 9, 2011.

A detailed description of the drilling conditions and materials encountered in the drill hole are documented on the log for BAH-01 provided in Appendix A1 of Part A of this report. The drill hole encountered colluvial material, bedrock and a void (inferred to be the St. Louis Tunnel) as summarized in Table 4.1.

From the surface to 210 feet the drill hole penetrated colluvium (i.e., slope debris) consisting of mixtures of gravel-, cobble- and boulder-sized blocks of bedrock set in a sandy silt matrix. These bedrock blocks were comprised of several different lithologies (i.e., rock types) including latite porphyry, sandstone, shale, quartzite, greenstone and quartz vein. Several blocks up to several feet long were encountered within the colluvium. The largest block of bedrock within the colluvium consisted of sandstone and limestone that was 8.5 feet in length.

The drilling, casing installation and sampling methods used to complete BAH-01 are summarized in Table 4.2. Drilling conditions in the colluvium were characterized as very difficult. The difficulties were attributed to the fact that the colluvium encountered in the drill hole was unstable in that portions of uncased hole would typically cave if the drill stem would have to be pulled back from the bottom of the hole for any reason. Another challenge for completion of the drill hole was the fact that the colluvium contained blocks of hard bedrock that were very difficult to penetrate to set casing to stabilize the hole. The colluvium was also relatively loose such that larger blocks of bedrock encountered in the colluvium tended to move during drilling and sometimes bind the drill stem. The thickness of the colluvium was unknown prior to drilling. For this reason, careful sampling of the larger bedrock blocks using diamond coring was necessary to determine if the drill hole was penetrating intact bedrock or larger blocks of bedrock within the colluvium. In addition, installation of casing using a casing shoe (that was required from 147 to 210 feet) could not be accomplished through harder bedrock blocks unless these blocks were pre-drilled using a diamond core bit and core barrel.

The drill hole was completed by installing steel casing through the colluvium and into the surface of the bedrock. The casing includes: 1) a larger casing (HWT casing) that extends from the surface to 186 feet; and 2) a smaller casing (HQ rods) that extends from the surface to 210 feet. Both sets of casing were left in the completed drill hole so that the hole would remain open and accessible for future surveys and sampling as necessary.

Bedrock was encountered between 210 and 240 feet in the drill hole. The bedrock was sampled by continuous coring. The bedrock consisted of an interbedded sequence of fine-grained sandstone and siltstone that was hydrothermally altered and mineralized with finely disseminated pyrite (Photo 4.11). The sandstone is medium greenish gray and the siltstone is medium dark gray. The bedrock is moderately hard, weak and closely fractured. Locally the bedrock sequence is cut by shear zones where the rock is closely to intensely fractured and contains clay gouge (i.e., fault gouge).

A void zone was encountered between 240 and 252 feet where the boring was terminated. The void was identified by the fact that the drill stem could be advanced by pushing the rods without rotation. When the void was encountered it was suspected to be the St. Louis Tunnel and the rods were pushed for 12 feet in an attempt to determine if drilling could be resumed on the far side of the tunnel. However, bedrock was not encountered within the 12 foot zone suggesting that the drill stem was following the wall of the tunnel rather than penetrating rock on the back side of the tunnel.

After the void was encountered the drill stem was extended approximately five (5) feet into the void and drill fluid was pumped down the drill stem for several minutes in an effort to agitate sediment or precipitate that was thought to likely be present in the tunnel so that a color change could possibly be detected where the flow from the St. Louis Tunnel daylights in the adit collapse reach shown on Figure 3.1. Thirty three minutes after drilling fluids were initially pumped into the tunnel a distinct red color change was noted in the St. Louis Tunnel discharge (Photo 4.12).

# 5.0 Laboratory Testing

## 5.1 Geotechnical Testing

Bulk samples acquired from the hand dug test pits described in Section 4.1 were tested for gradation, plasticity (Atterberg limits) and laboratory moisture/density relationship (i.e., Proctor density). The results of the laboratory testing are included on Table 1.1A in Part A of this report; laboratory data sheets for this testing are provided in Appendix A2 of Part A.

The results of the field density/moisture content testing are included with the laboratory testing results in Appendix A2 of Part A of this report.

Three (3) of the samples tested classify as non-plastic to very low plasticity silty gravel with sand; one sample tested as low plasticity clayey gravel with sand; and the other sample was slightly plastic silty, clayey sand with gravel. The percent fines of the minus 3 to 4 inch fraction of these samples ranged from 13 to 22 percent. The percent of oversize material (greater than 3 or 4 inches) ranged from 14 to 33 percent. Corrected maximum dry density of these samples ranged from 127.2 to 138.0 pcf with optimum moisture contents ranging from 7.6 to 9.3 percent.

### 5.2 Water and Solids Testing

Samples of water and what are inferred to be settled precipitated metal/hydroxide solids (possibly mixed with some rock flour sediments) were tested for a suite of chemical analytes at Pace Analytical Services, Inc. of Lenexa, Kansas. The results of this testing are presented in Appendix D1. Interpretation of these results will be integrated with ongoing studies of the St. Louis Tunnel discharge source waters and reported later.

## 6.0 References

Atlantic Richfield Company. 2011. Investigation Plan for Collapsed Adit Area at St. Louis Tunnel, Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado; submitted to US EPA, Region 8, Denver, CO. August 29.

McKnight, E.T. 1974. Geology and Ore Deposits of the Rico District, Colorado; U.S. Geological Survey Professional Paper No. 723.

# PHOTOS

**Photo 2.1** - Station 46+00 to 45+79

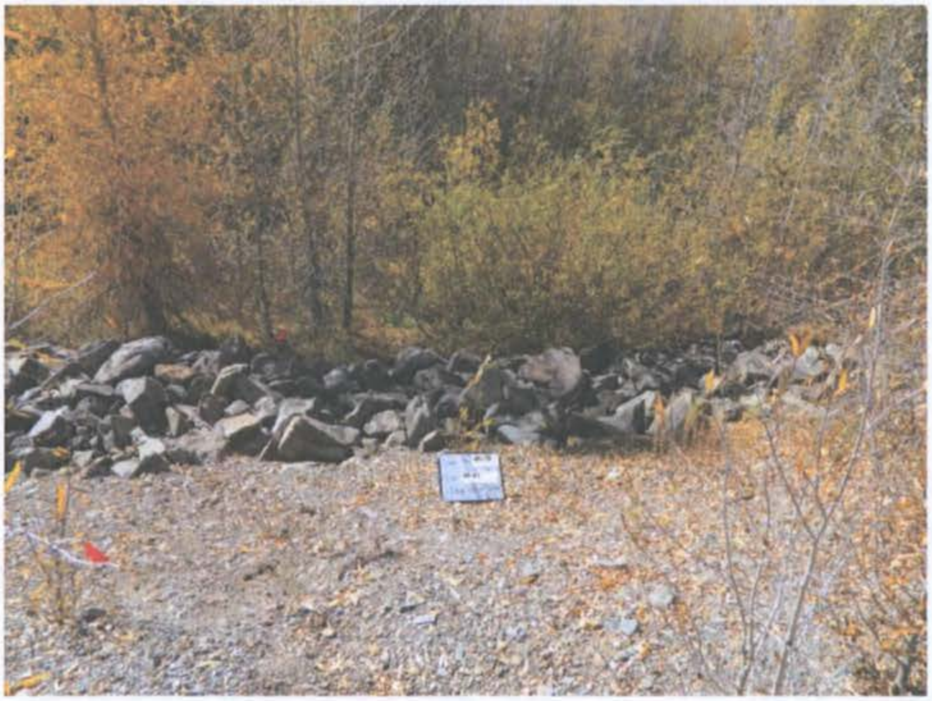


**Photo 2.2** - Station 45+79 to 45+61

**Photo 2.3** - Station 45+61 to 45+25

**Photo 2.4** - Station 45+25 to 44+83

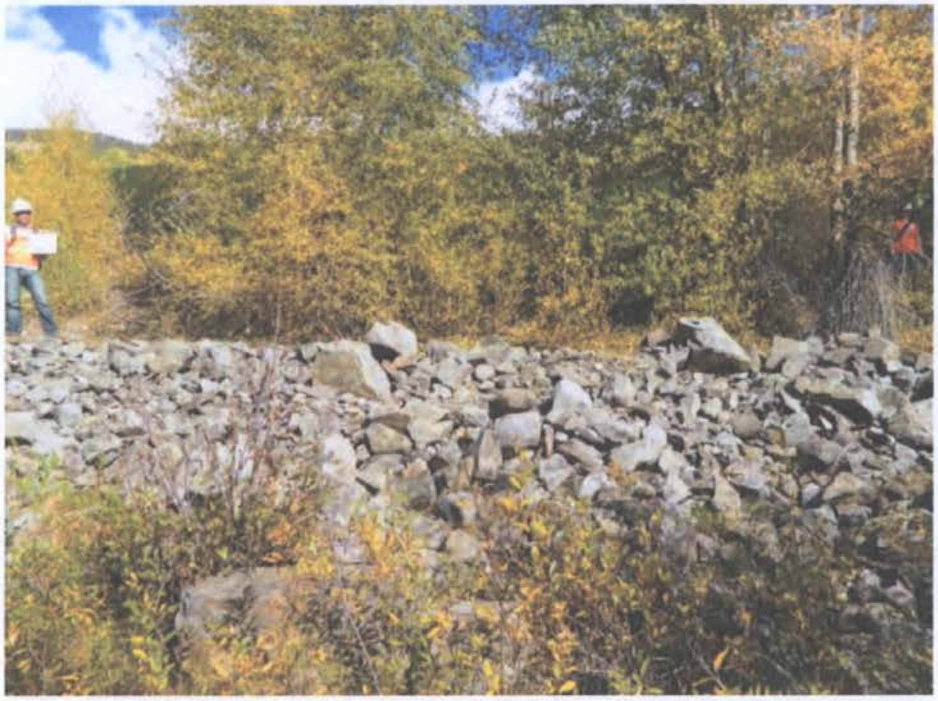


**Photo 2.5** – Station 44+83 to 44+39

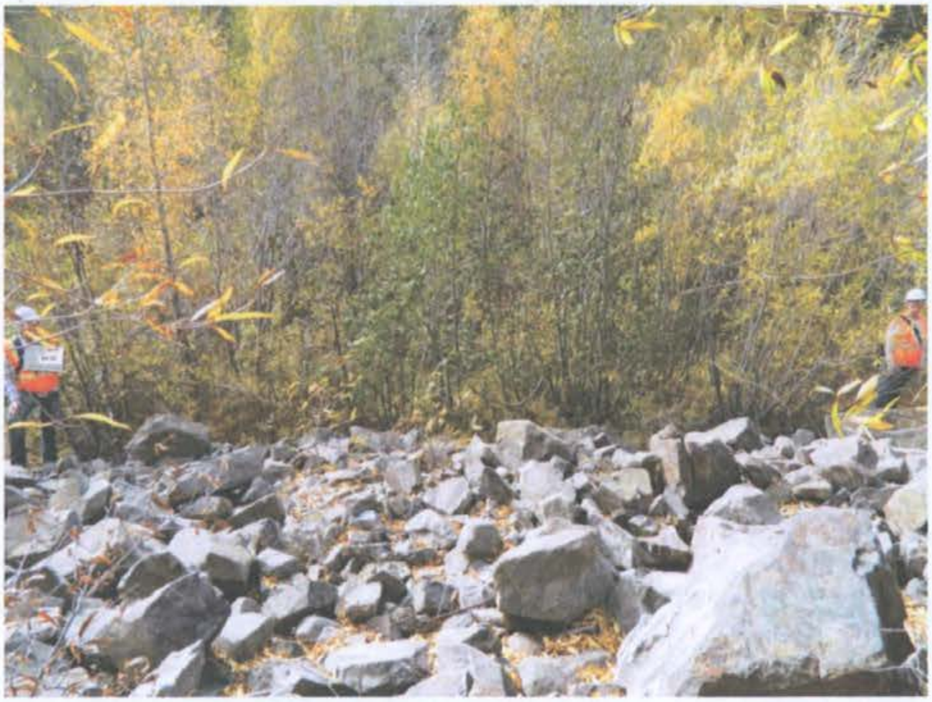


**Photo 2.6** – Station 44+39 to 44+06

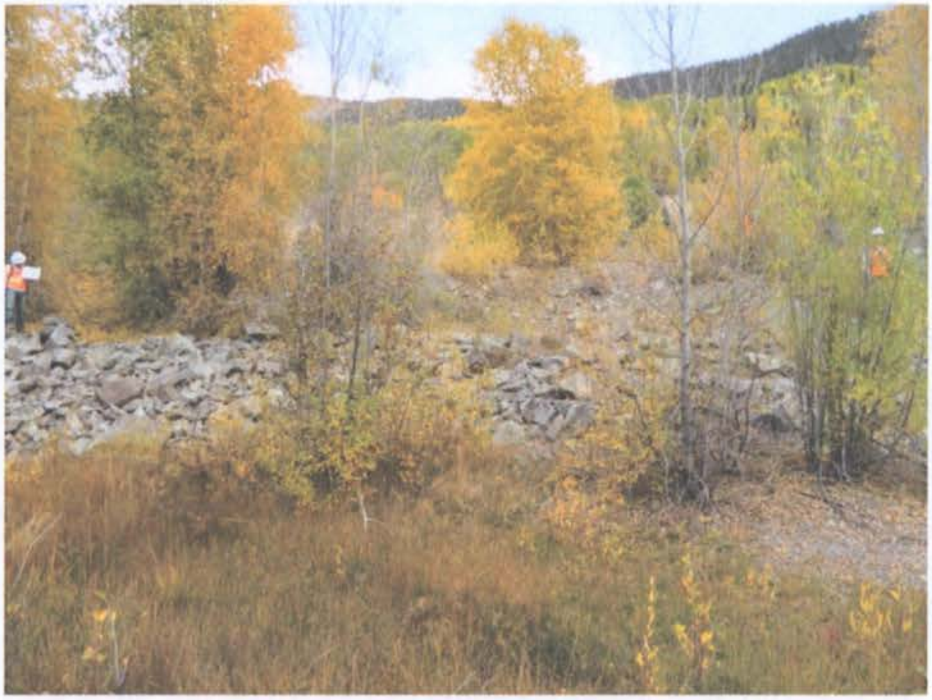


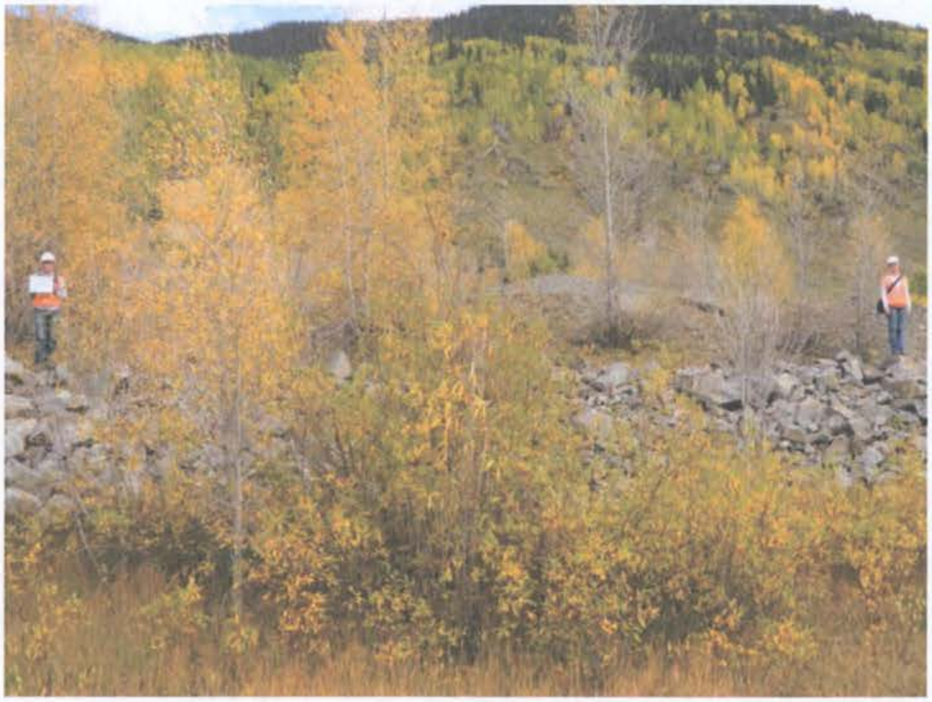
**Photo 2.7** – Station 44+06 to 43+52

**Photo 2.8** – Station 43+52 to 43+04

**Photo 2.9** – Station 43+04 to 42+52

**Photo 2.10** – Station 42+52 to 42+07

**Photo 2.11** – Station 43+00 to 42+50



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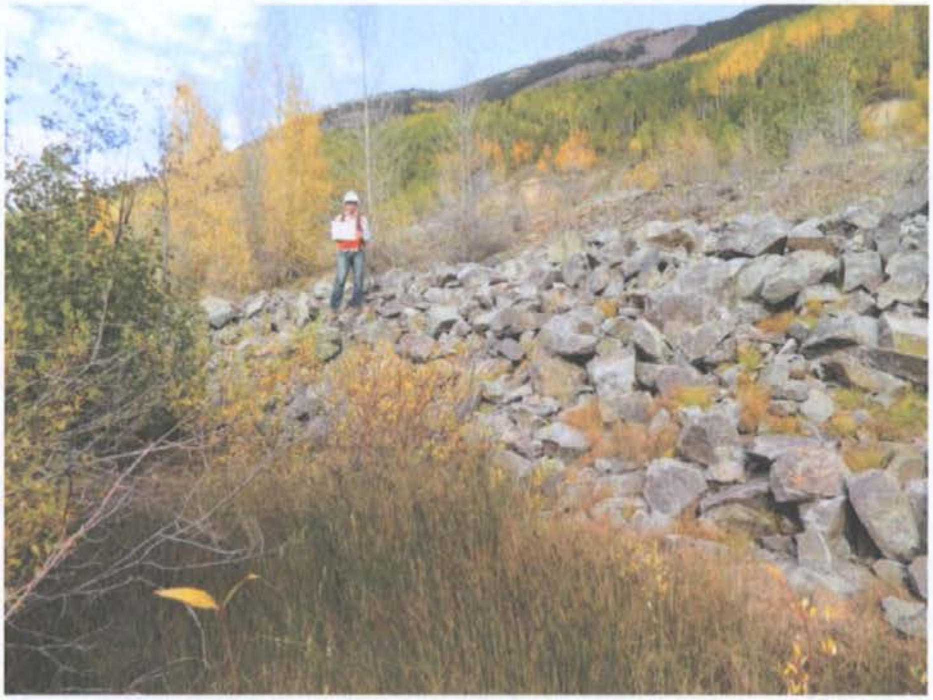

**Photo 2.13** – Station 42+00 to 41+50

**Photo 2.14** – Station 41+50 to 41+00

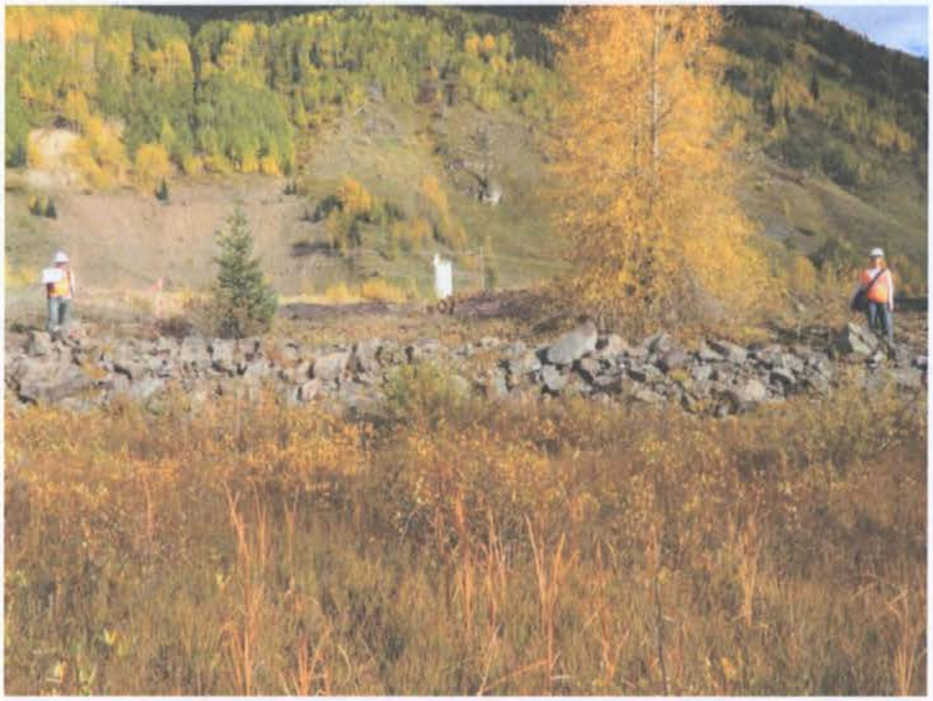

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**Photo 2.16** – Station 40+50 to 40+00

**Photo 2.17** – Station 40+00 to 38+00

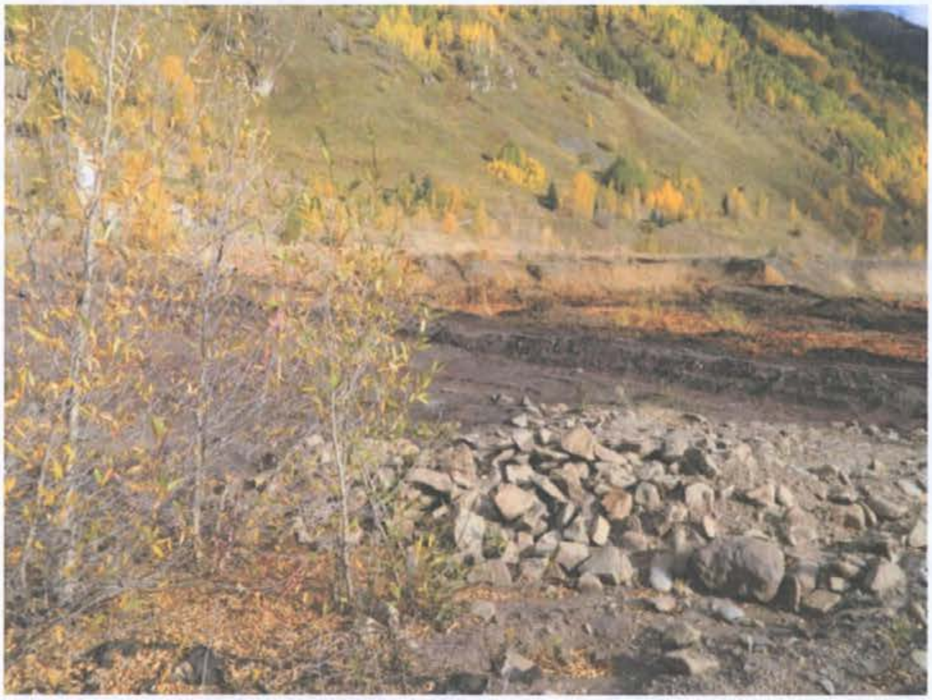


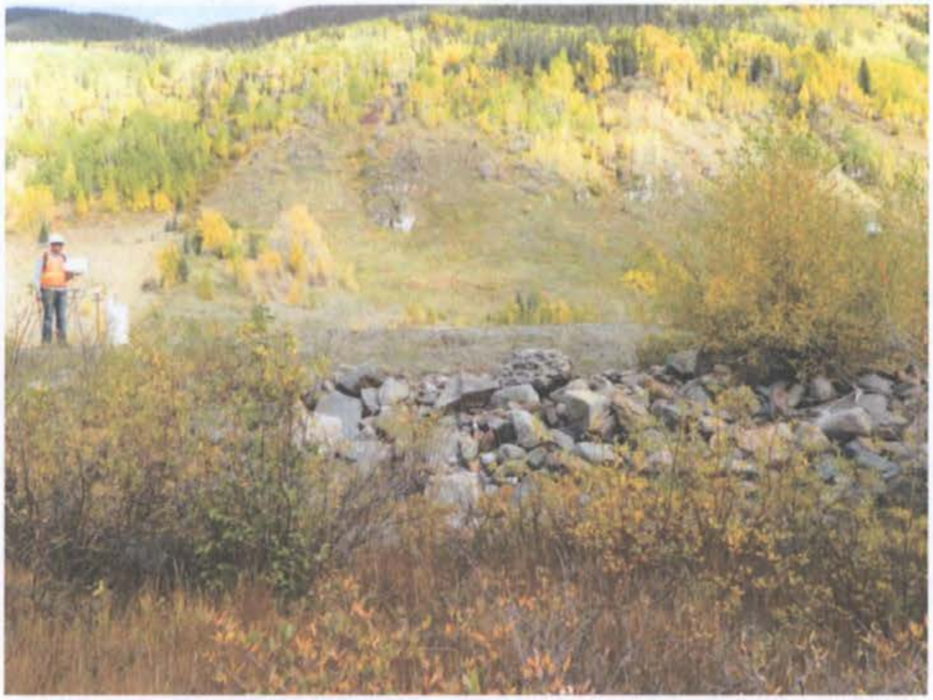
**Photo 2.18** – Station 38+00 to 37+78

**Photo 2.19** – Station 37+78 to 37+52

**Photo 2.20** – Station 37+52 to 37+22

**Photo 2.21** – Station 37+22 to 36+88

**Photo 2.22** – Station 36+88 to 36+46



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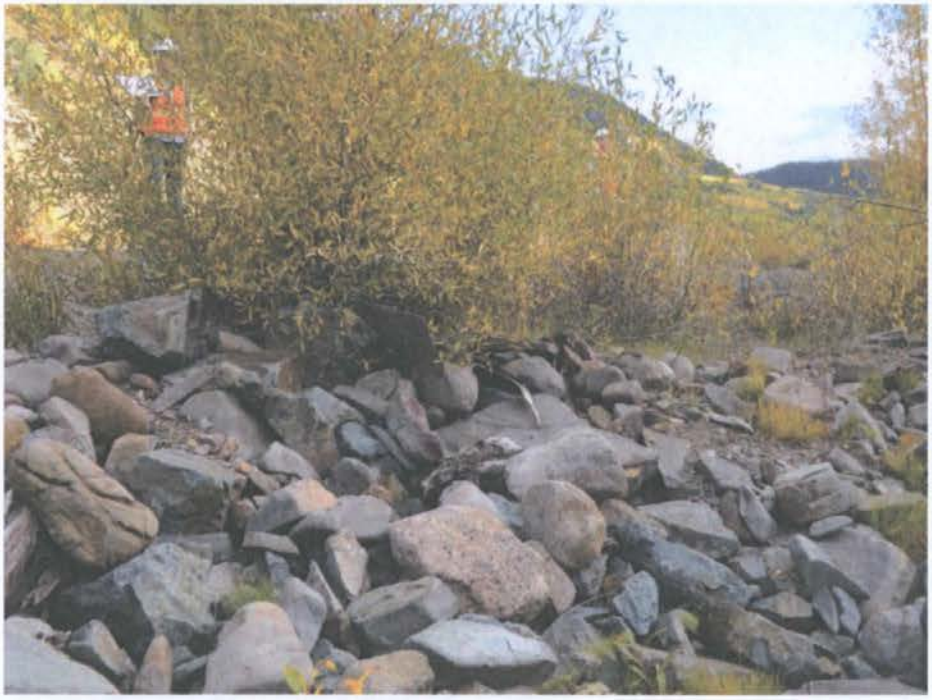

**Photo 2.24** – Station 36+07 to 36+00

**Photo 2.25** – Station 36+00 to 35+69

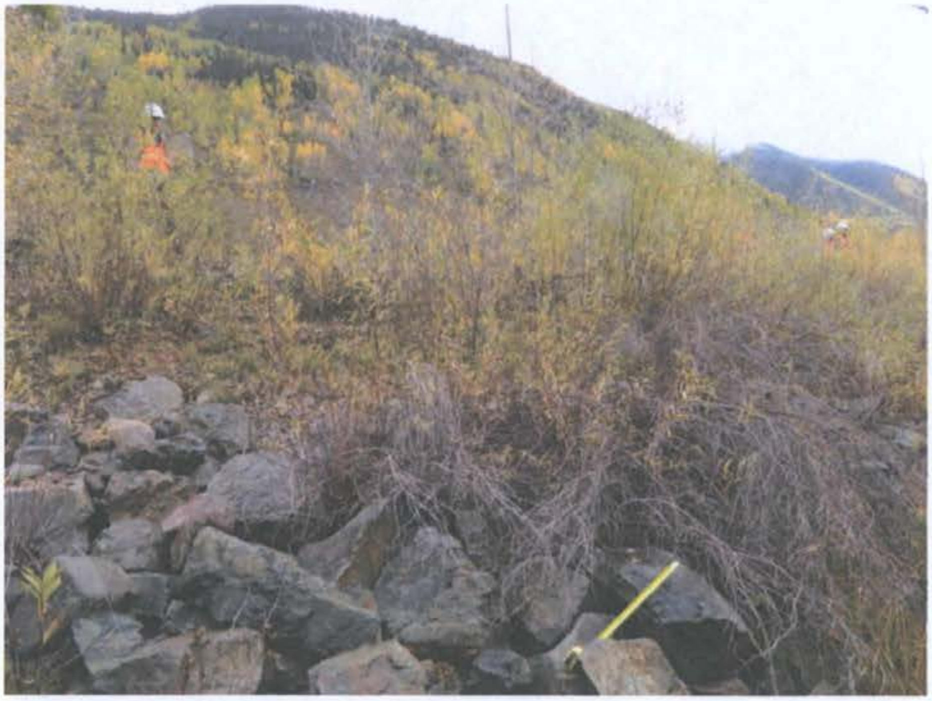

**Photo 2.26** – Station 35+69 to 35+18

**Photo 2.27** – Station 35+18 to 34+82

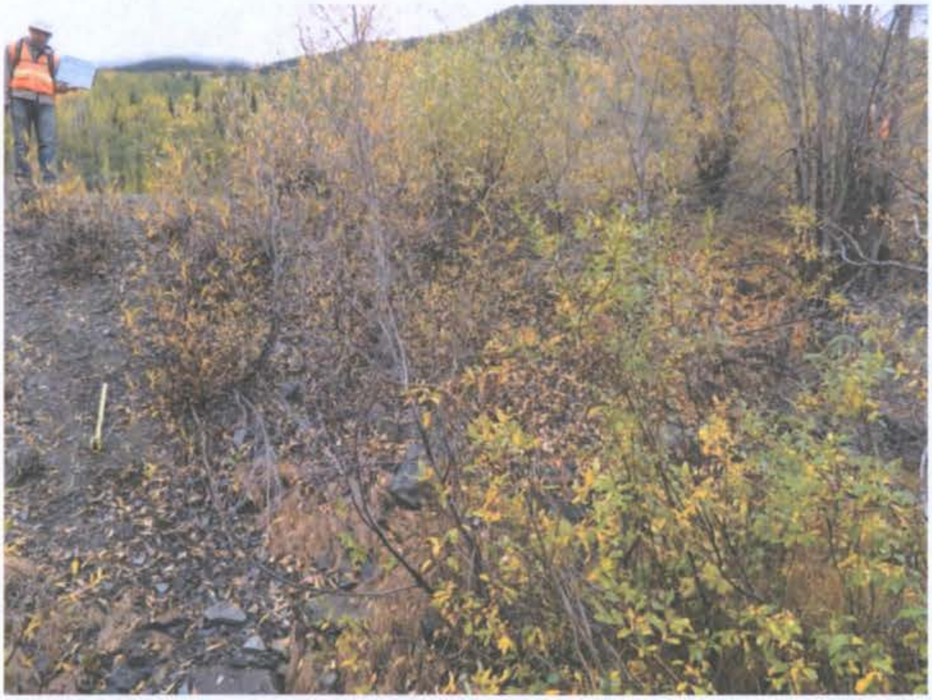

**Photo 2.28** – Station 34+47 to 34+11

**Photo 2.29** – Station 34+47 to 34+11

**Photo 2.30** – Station 34+11 to 34+00

**Photo 2.31** – Station 34+00 to 33+65

**Photo 2.32** – Station 33+65 to 33+15

**Photo 2.33** – Station 33+15 to 32+65

**Photo 2.34** – Station 32+65 to 32+15

**Photo 2.35** – Station 32+15 to 32+00

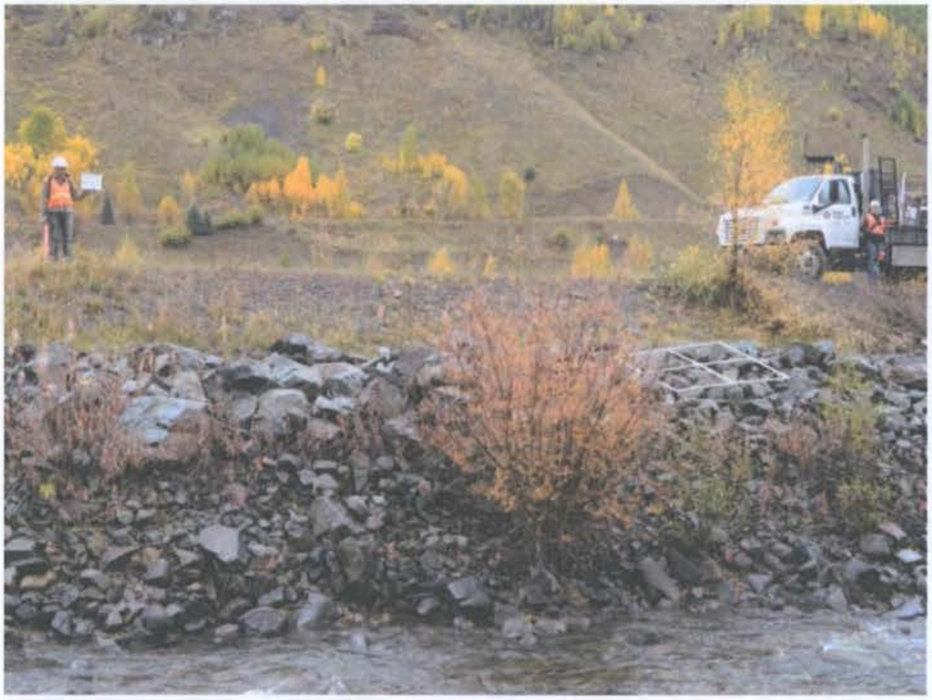

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**Photo 2.37** – Station 31+50 to 31+00

**Photo 2.38** – Station 31+00 to 30+50

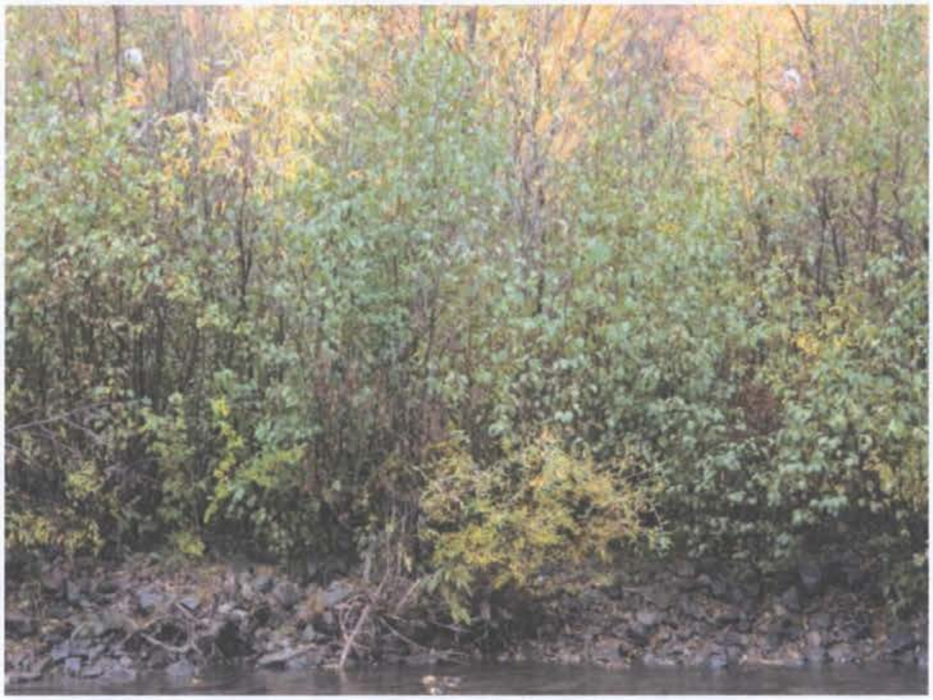

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**Photo 2.40** – Station 30+00 to 29+50

**Photo 2.41** – Station 29+50 to 29+00

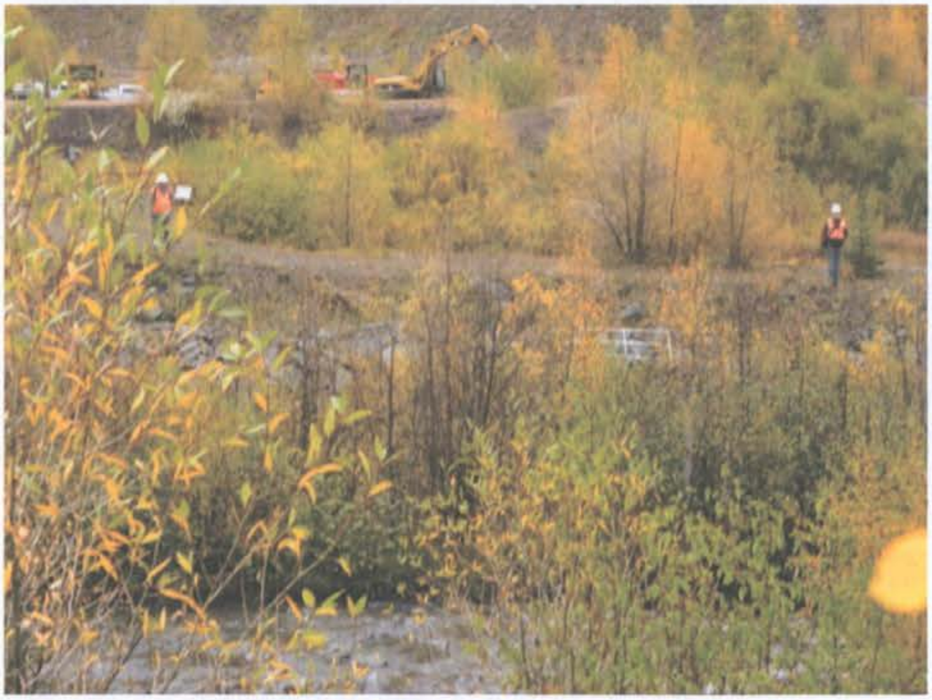

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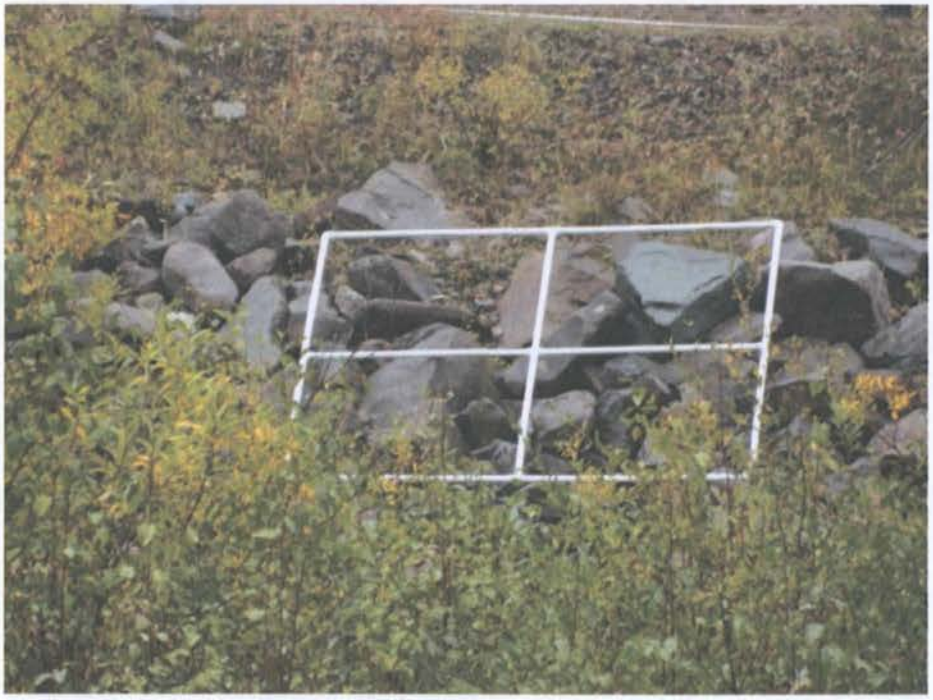
**Photo 2.43** – Station 28+50 to 28+00



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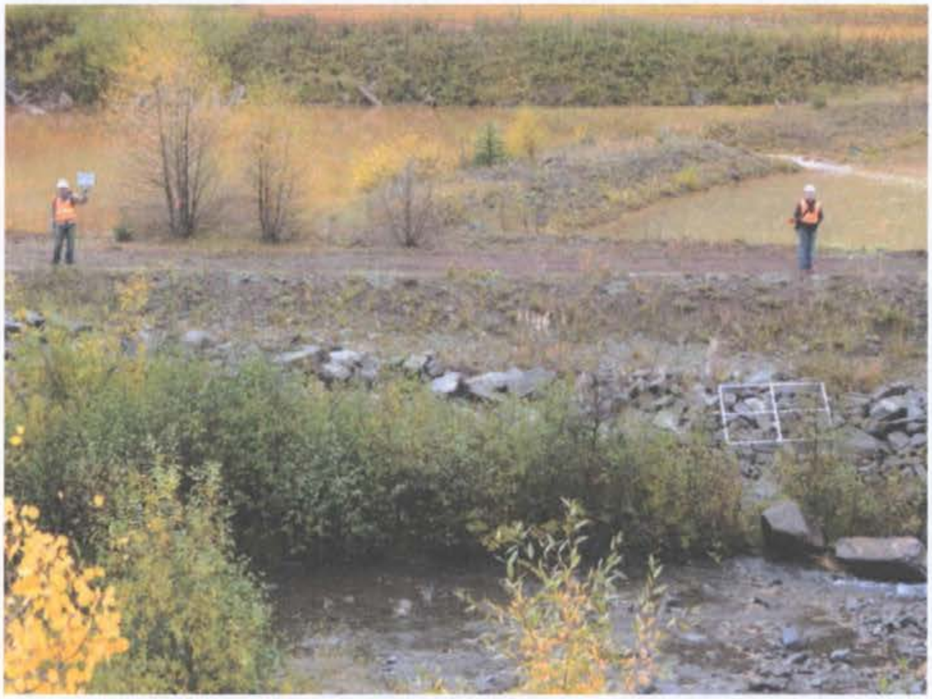


**Photo 2.45** – Station 27+50 to 27+00

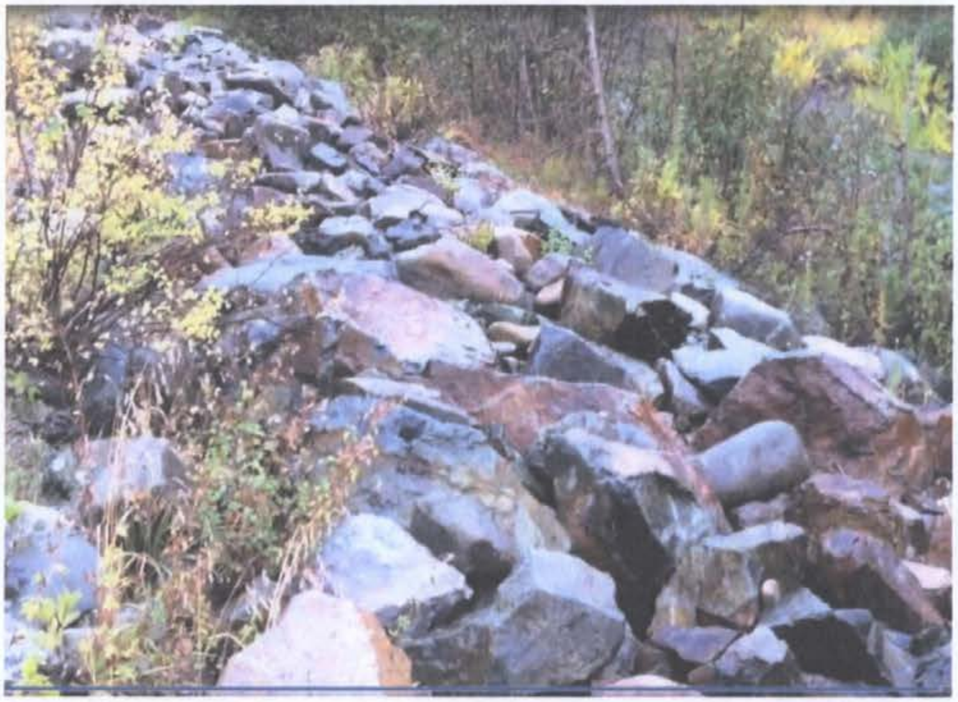
**Photo 2.46** – Station 27+00 to 26+50

**Photo 2.47** – Station 26+47 to 26+00

**Photo 2.48** – Station 26+00 to 25+50

**Photo 2.49** – Station 25+50 to 25+00

**Photo 2.50** – Station 25+00 to 24+50



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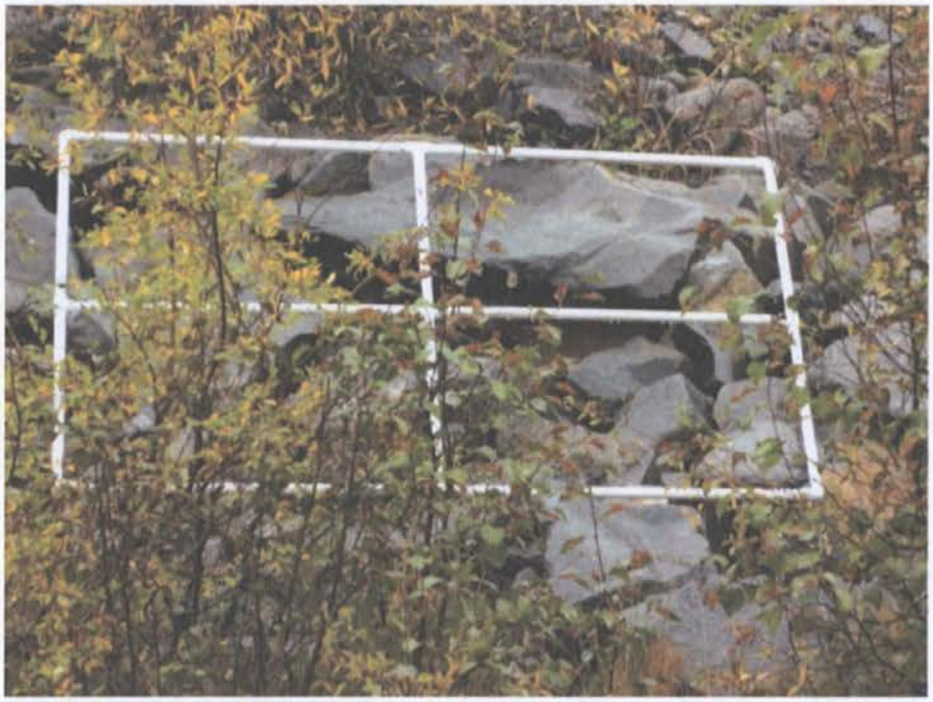

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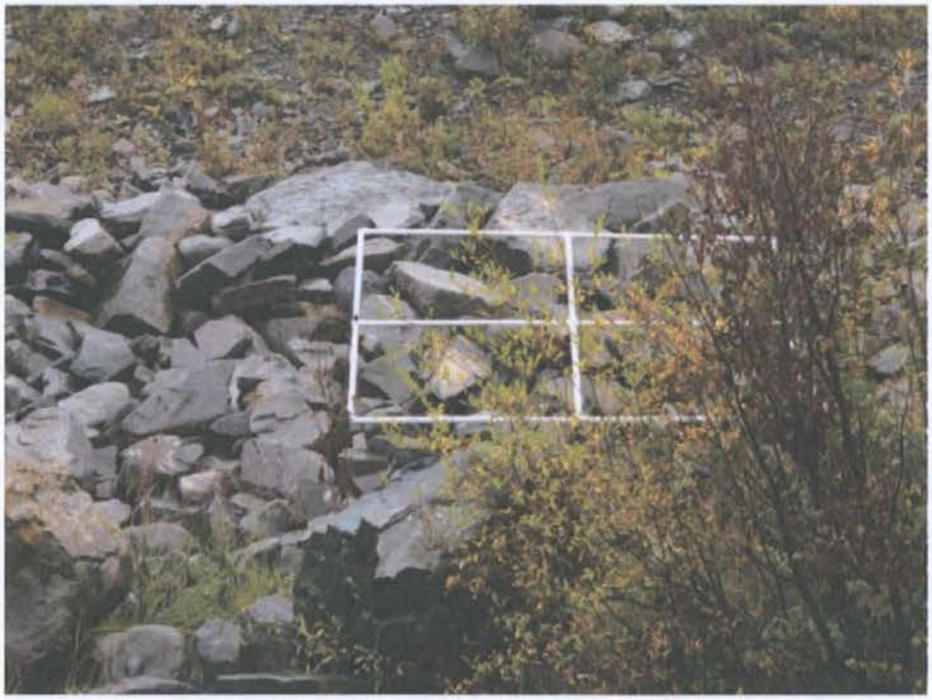

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**Photo 2.58** – Station 21+00 to 20+50

**Photo 2.59** – Station 20+50 to 20+00

**Photo 2.60** – Station 20+00 to 19+50

**Photo 2.61** – Station 19+20 to 19+00

**Photo 2.62** – Station 19+00 to 18+50

**Photo 2.63** – Station 18+50 to 18+00

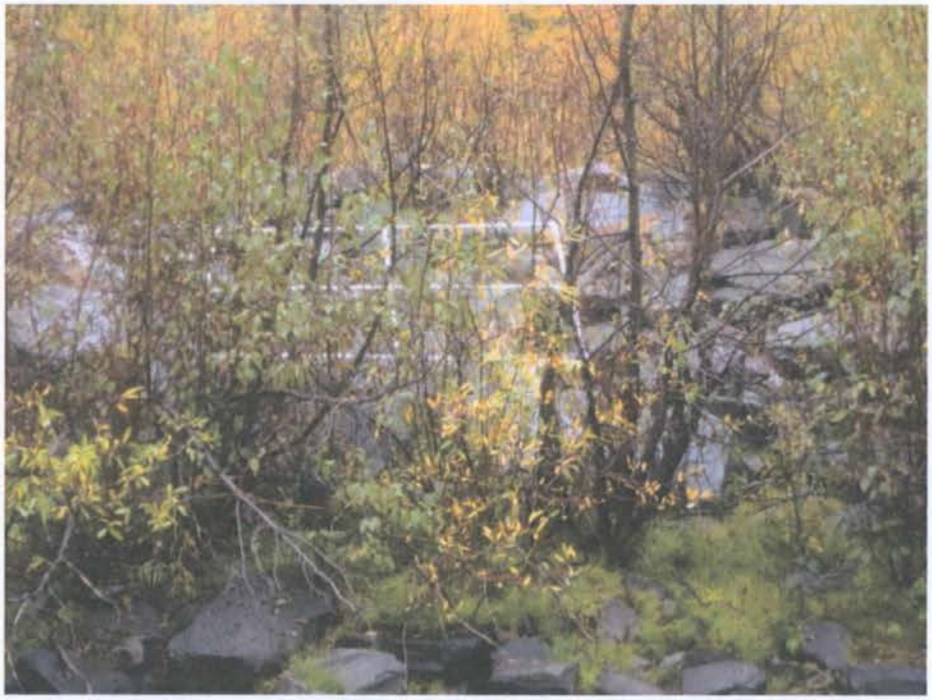

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Photo 2.65 – Station 17+50 to 17+00

Photo 2.66 – Station 17+00 to 16+50

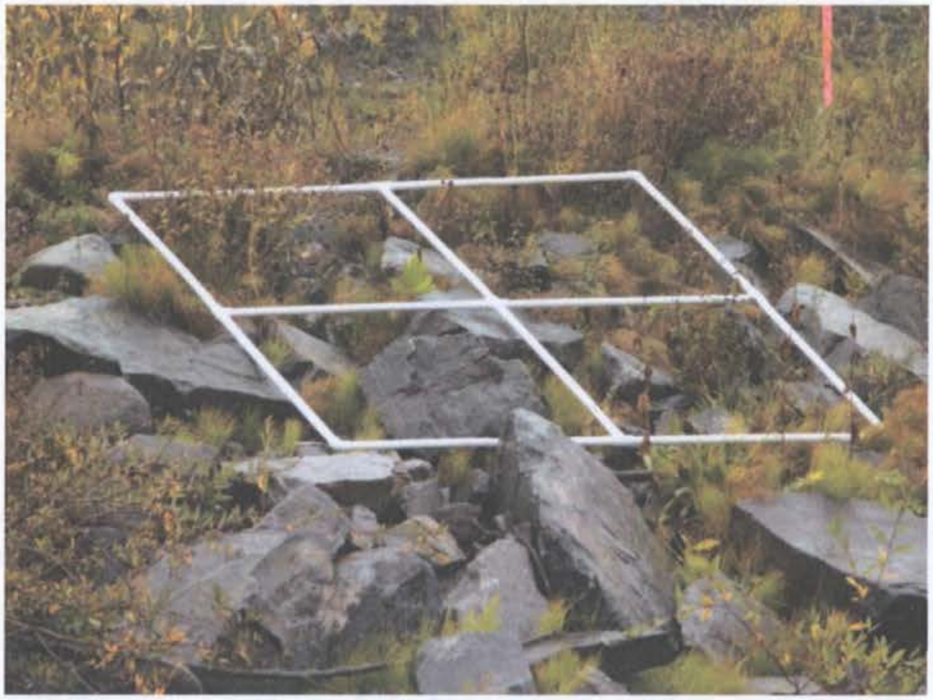


**Photo 2.67** – Station 16+50 to 16+00

**Photo 2.68** – Station 16+00 to 15+50

**Photo 2.69** – Station 15+50 to 15+00

**Photo 2.70** – Station 15+00 to 14+50

**Photo 2.71** – Station 14+50 to 14+00

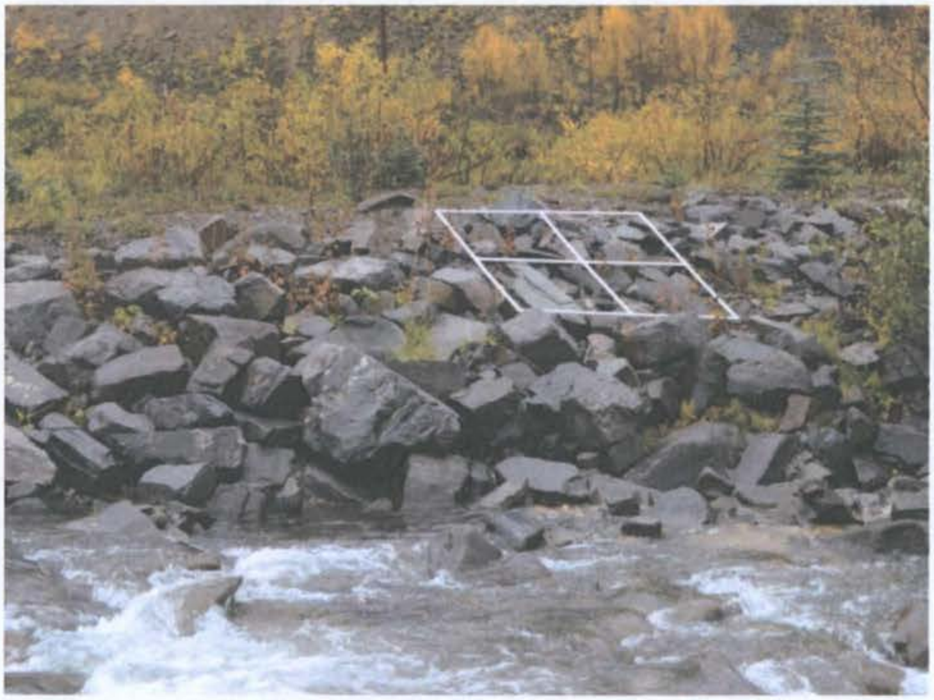


**Photo 2.72** – Station 14+00 to 13+50

**Photo 2.73** – Station 13+50 to 13+00

**Photo 5.1** – Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD1

**Photo 5.2** – Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD6

**Photo 5.3** – Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD7

**Photo 5.4** – Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD8

**Photo 5.5** – Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD13

**Photo 5.6** – Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD14

**Photo 5.7**– Photo of Representative Riprap Bedding (Fine Material beneath Larger Stones) in Test Pit TP2011-FD15

# APPENDICES

Appendix B1 – Field Data Log

Appendix B2 – Grid Data

Appendix B3 – 100-year Flow Rate Calculations

Appendix B4 – Manning's 'n' Calculations

Appendix B5 – HEC RAS Output Tables / Cross-Sections

Appendix B6 – Riprap Scour Calculations

# APPENDIX B1
# FIELD DATA LOG

| | |
|---|---|
| **Client:** | **Atlantic Richfield** |
| **Project:** | **Rico - Argentine Mine Site** |

## FIELD DATA INDEX

| Photo ID | Photo Date | Representative Photo ID | Photo Number in Section B | Start STA | End STA | Grid STA | Grid | Grid Photos | Grid Videos | Test Pit STA | Test Pit ID | OLD TP ID | TP Video | Cross Section | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0009-0012 | 10/3/2011 | 10 | 5.1 | 46+00 | 45+79 | | | | | | | | | | At the beginning of our field investigation, by mistake we began documenting the stationing numbers as increasing. We did not realize the station numbers were actually decreasing until STA 43+00. The photos for this section were partially corrected to account for this error; however, also at the time we did not realize the stationing markers were taken from the centerline of the river; therefore, our measurements do not exactly match the stationing documented on the figures. Fortunately the stretch from STA 46+00 to STA 43+00 is consistent and documented by the grid taken at grid location GR 1 at approximate STA 44+50. |
| 0013-0018 | 10/3/2011 | 15 | 5.2 | 45+79 | 45+61 | | | | | | | | | | |
| 0019-0022 | 10/3/2011 | 20 | 5.3 | 45+61 | 45+25 | | | | | | | | | | |
| 0023-0026 | 10/3/2011 | 24 | 5.4 | 45+25 | 44+83 | | | | | | | | | BXS-3 | |
| 0027-0031 | 10/3/2011 | 28 | 5.5 | 44+83 | 44+39 | **44+50** | **GR 1** | **0427-0436** | **0437** | | | | | | |
| 0032-0035 | 10/3/2011 | 35 | 5.6 | 44+39 | 44+06 | | | | | | | | | | |
| 0036-0039 | 10/3/2011 | 38 | 5.7 | 44+06 | 43+52 | | | | | | | | | | |
| 0040-0045 | 10/3/2011 | 44 | 5.8 | 43+52 | 43+04 | | | | | | | | | BXS-4 | |
| 0046-0048 | 10/3/2011 | 48 | 5.9 | 43+04 | 42+52 | | | | | | | | | | |
| 0049-0051 | 10/3/2011 | 50 | 5.10 | 42+52 | 42+07 | | | | | | | | | | |
| 0052-0054 | 10/3/2011 | 53 | 5.11 | 43+00 | 42+50 | | | | | | | | | | |
| 0055-0057 | 10/3/2011 | 56 | 5.12 | 42+50 | 42+00 | | | | | | | | | | |
| 0058-0061 | 10/3/2011 | 60 | 5.13 | 42+00 | 41+50 | | | | | | | | | | |
| 0062-0064 | 10/3/2011 | 63 | 5.14 | 41+50 | 41+00 | | | | | | | | | | |
| 0065-0067 | 10/3/2011 | 66 | 5.15 | 41+00 | 40+50 | 41+00 | GR 2 | 0438-0439 | 0456, 0440 | 41+00 | TP2011-FD1 | TP E8 | 0458-0460 | | |
| 0068-0075 | 10/3/2011 | 72 | 5.16 | 40+50 | 40+00 | | | | | | | | | BXS-5 | |
| **0076-0082** | 10/3/2011 | **80** | **5.17** | **40+00** | **38+00** | | | | | | | | | | |
| 0083-0087 | 10/3/2011 | 87 | 5.18 | 38+00 | 37+78 | | | | | | | | | | |
| 0088-0092 | 10/3/2011 | 92 | 5.19 | 37+78 | 37+52 | | | | | | | | | | |
| 0093-0095 | 10/3/2011 | 95 | 5.20 | 37+52 | 37+22 | | | | | | | | | BXS-6 | |
| 0096-0099 | 10/3/2011 | 98 | 5.21 | 37+22 | 36+88 | | | | | | | | | | |
| **0100-0102** | **10/3/2011** | **101** | **5.22** | **36+88** | **36+46** | **36+50** | **GR 3A & 3B** | **0329-0334** | **0336** | **36+50** | **TP2011-FD2** | **TP 3A** | | | **** Photo from Allen shows a sample was taken at TP 3A** |
| 0103-0105 | 10/3/2011 | 105 | 5.23 | 36+46 | 36+07 | | Reach #3 | | | | | | | | |
| **0106-0108** | **10/3/2011** | **108** | **5.24** | **36+07** | **36+00** | **36+00** | **GR 3C1** | **0337-0338** | **0339** | **36+00** | **TP2011-FD3** | **TP 3C1** | | | **** Photo from Allen shows a sample was taken at TP 3C1** |
| **0109-0113** | **10/3/2011** | **110** | **5.25** | **36+00** | **35+69** | **36+00** | **GR 3C2** | **0340-0341** | **0342** | **36+00** | **TP2011-FD4** | **TP E1** | **0443** | **BXS-7** | **** Photo from Allen shows a sample was taken at TP E1** |
| 0114-0119 | 10/4/2011 | 115 | 5.26 | 35+69 | 35+18 | | | | | | | | | | |
| **0120-0123** | **10/4/2011** | **123** | **5.27** | **35+18** | **34+82** | **35+00** | **GR 3D** | **0345** | **0343** | **35+00** | **TP2011-FD5** | **TP 3D** | | **BXS-8** | **** Photo from Allen shows a sample was taken at TP 3D** |
| 0124-0126 | 10/4/2011 | 125 | 5.28 | 34+82 | 34+47 | | | | | | | | | | |
| 0127-0129 | 10/4/2011 | 128 | 5.29 | 34+47 | 34+11 | | | | | | | | | | |
| **0130-0135** | **10/4/2011** | **133** | **5.30** | **34+11** | **34+00** | | | | | **34+00** | **TP2011-FD6** | **TP E6** | **0445, 0449** | | **** Photo from Allen shows a sample was taken at TP E6** |
| **0136-0140** | **10/4/2011** | **139** | **5.31** | **34+00** | **33+65** | **33+69 (65)** | **GR 4A & 4B** | **0144-0148, 2101, 2100, 2099** | **0356, E0441** | **33+75 (78)** | **TP2011-FD7** | **TP 4A** | **0441, E006-014** | | **** Photos 02099-02101 show GR 4A at STA 33+91** |
| | | | | | | | | | | **33+65** | **TP2011-FD8** | **TP E2** | **E02122-E02124** | | **** Photo from Allen shows a sample was taken at TP E2** |
| **0141-0143** | **10/4/2011** | **143** | **5.32** | **33+65** | **33+15** | **33+55** | **GR 5A & 5B** | **0151-0155** | **0367, 0374** | **33+25** | **TP2011-FD9** | **TP E7** | **0451-0453** | **BXS-9** | |
| 0149-0150 | 10/4/2011 | 150 | 5.33 | ~~33+75~~ 33+15 | 32+65 | | | | | | | | | | |
| **0156-0158** | **10/4/2011** | **157** | **5.34** | **32+65** | **32+15** | | | | | **32+65** | **TP2011-FD10** | **TP E3** | **E02127** | | |
| 0160-0162 | 10/4/2011 | 162 | 5.35 | 32+15 | 32+00 | | | | | | | | | | |
| 0163-0165 | 10/4/2011 | 164 | 5.36 | 32+00 | 31+50 | | | | | | | | | | |
| **0171-0172** | **10/4/2011** | **172** | **5.37** | **31+50** | **31+00** | **31+25** | **GR 6A & 6B** | **0166-0170** | **0377, 0380, E0441** | **31+25** | **TP2011-FD11** | **TP 6A** | **016** | | |
| 0173-0174 | 10/4/2011 | 174 | 5.38 | 31+00 | 30+50 | | | | | | | | | | |
| 0175-0177 | 10/4/2011 | 177 | 5.39 | 30+50 | 30+00 | | | | | | | | | | |
| 0178-0179 | 10/4/2011 | 179 | 5.40 | 30+00 | 29+50 | | | | | | | | | | |
| 0180-0182 | 10/4/2011 | 182 | 5.41 | 29+50 | 29+00 | | | | | | | | | BXS-10 | |
| **0187-0188** | **10/4/2011** | **188** | **5.42** | **29+00** | **28+50** | **28+61** | **GR 7A & 7B** | **0183-0185** | **0186, 0384, 0387, 047** | | | | | | |
| **0189-0191** | **10/4/2011** | **191** | **5.43** | **28+50** | **28+00** | | | | | **28+25** | **TP2011-FD12** | **TP 7** | **E02128-E02129** | | |
| **0194-0200** | **10/4/2011** | **200** | **5.44** | **28+00** | **27+50** | **27+95** | **GR 7C** | **0192-0193** | **0391, 046** | **27+80** | **TP2011-FD13** | **TP 8** | **E02130** | | **** Photo from Allen shows a sample was taken at TP 8** |
| 0201-0205 | 10/4/2011 | 204 | 5.45 | 27+50 | 27+00 | | | | | | | | | | |
| 0213-0216 | 10/4/2011 | 214 | 5.46 | 27+00 | 26+50 | | | | 0217 | | | | | | |

| | |
|---|---|
| **Client:** | **Atlantic Richfield** |
| **Project:** | **Rico - Argentine Mine Site** |

## FIELD DATA INDEX

Reach #6

| Photo ID | Photo Date | Representative Photo ID | Photo Number in Section B | Start STA | End STA | Grid STA | Grid | Grid Photos | Grid Videos | Test Pit STA | Test Pit ID | OLD TP ID | TP Video | Cross Section | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0218-0222 | 10/4/2011 | 222 | 5.47 | 26+47 | 26+00 | **26+47** | **GR 8A & 8B** | **0206-0212, 0392 0395** | **0394,0396** | | | | | | |
| 0223-0226 | 10/4/2011 | 225 | 5.48 | 26+00 | 25+50 | | | | | | | | | | |
| 0227-0229 | 10/4/2011 | 228 | 5.49 | 25+50 | 25+00 | | | | | | | | | | |
| 0230-0232 | 10/4/2011 | 232 | 5.50 | 25+00 | 24+50 | | | | | | | | | | |
| 0233 | 10/4/2011 | | 5.51 | 24+50 | 24+00 | | | | | | | | | | |
| **0234-0237** | **10/4/2011** | **236** | **5.52** | **24+00** | **23+50** | **23+72** | **GR 9A & 9B** | **0238-0241** | **0399, 0401** | | | | | | |
| 0242-0247 | 10/4/2011 | 246 | 5.53 | 23+50 | 23+00 | | | 0244 | | | | | | | ** Beginning of using video to call out stationing |
| 0249-0251 | 10/4/2011 | 249 | 5.54 | 23+00 | 22+50 | | | 0248 | | | | | | | |
| 0253-0255 | 10/4/2011 | 254 | 5.55 | 22+50 | 22+00 | | | 0252 | | | | | | | |
| 0257-0259 | 10/4/2011 | 258 | 5.56 | 22+00 | 21+50 | | | 0256 | | | | | | | |
| **0261-0262** | **10/4/2011** | **261** | **5.57** | **21+50** | **21+00** | **21+00** | **GR E4** | **0260** | **0414** | **21+00** | **TP2011-FD14** | **TP E4** | **E02131 - E02140** | | |
| 0264-0265 | 10/4/2011 | 265 | 5.58 | 21+00 | 20+50 | | | 0263 | | | | | | BXS-11 | |
| 0267-0268 | 10/4/2011 | 268 | 5.59 | 20+50 | 20+00 | | | 0266 | | | | | | | |
| 0270-0273 | 10/4/2011 | 271 | 5.60 | 20+00 | 19+50 | | | 0269 | | | | | | | |
| **0275-0278** | | **276** | **5.61** | **19+50** | **19+00** | **19+50** | **GR E5** | **0274, 0420** | | **19+50** | **TP2011-FD15** | **TP E5** | **E02141-E02142** | | **** Photo from Allen shows a sample was taken at TP e5** |
| 0280-0282 | | 282 | 5.62 | 19+00 | 18+50 | | | 0279 | | | | | | | |
| 0284-0287 | | 284 | 5.63 | 18+50 | 18+00 | | | 0283 | | | | | | | |
| 0289-0292 | | 291 | 5.64 | 18+00 | 17+50 | | | 0288 | | | | | | | |
| 0294-0297 | | 296 | 5.65 | 17+50 | 17+00 | | | 0293 | | | | | | | |
| 0300-0301 | | 300 | 5.66 | 17+00 | 16+50 | | | 0298, 0299 | | | | | | | |
| 0303-0305 | | 305 | 5.67 | 16+50 | 16+00 | | | 0302 | | | | | | | |
| 0307-0309 | | 309 | 5.68 | 16+00 | 15+50 | | | 0306 | | | | | | | |
| 0311-0312 | | 311 | 5.69 | 15+50 | 15+00 | | | 0310 | | | | | | | |
| 0314-0315 | | 315 | 5.70 | 15+00 | 14+50 | | | 01314 | | | | | | | |
| 0317-0319 | | 319 | 5.71 | 14+50 | 14+00 | | | 0316 | | | | | | | |
| 0321-0323 | | 322 | 5.72 | 14+00 | 13+50 | | | 0320 | | | | | | | |
| 0325-0327 | | 326 | 5.73 | 13+50 | 13+00 | | | 0324 | | | | | | | |

# APPENDIX B2
# GRID DATA

AECOM
Client: Atlantic Richfield
Project: Rico
Detail: Grid Riprap Gradations

Job No.: 60157757.300
Date Chkd:
Chkd By:

Comp. By: TAW
Date: 10-13-11
Page No.: 1

**Grid ID:** 1
**Grid STA:** ~ 44+50
**Pond:** At parking pad in river overflow channel

| | Grid Cell | | | |
|---|---|---|---|---|
| **Rock Size** | **1** | **2** | **3** | **4** |
| **2' +** | | | | |
| **1' - 2'** | 5 | 5 | 8 | 5 |
| **3" - 1'** | 16 | 21 | 21 | 40 |
| **1/4" - 3"** | 9 | 2 | 5 | 5 |
| **fines** | | | | |

**Vegetation:** Heavy treed vegetation on the slope above the riprap. Heavy tree and brush vegetation in the river overflow channel at the embankment toe.

**Slope:** 25 degrees

**Grid ID:** 2
**Grid STA:** 41+00
**Pond:** Upstream of Pond 18 in the river overflow channel

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **2' +** | | 1 | 1 | |
| **1' - 2'** | 4 | 5 | 4 | 4 |
| **3" - 1'** | 49 | 24 | 27 | 33 |
| **1/4" - 3"** | 30% | 15% | 15% | 10% |
| **fines** | | | | |

**Vegetation:** Minimal vegetation on the slope above the riprap due to construction. Heavier vegetation at the toe of the embankment in the river overflow channel.

**Slope:** 25 degrees

**Grid ID:** 3A
**Grid STA:** 36+50
**Pond:** Adjacent to Pond 18, top of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **2' +** | | | | |
| **1' - 2'** | | | | |
| **3" - 1'** | | | 2 | 2 |
| **1/4" - 3"** | 90% | 90% | 90% | 90% |
| **fines** | 10% | 10% | 8% | 8% |

**Vegetation:** Light vegetation (weeds). Two separate placements of fill. Much flatter on top, steeper on bottom, very little rock in both.

**Slope:** 10 degrees Top, 25 degrees BTM

**Grid ID:** 3B
**Grid STA:** 36+50
**Pond:** Adjacent to Pond 18, bottom of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **2' +** | | | | |
| **1' - 2'** | 2 | | | |
| **3" - 1'** | 17 | 9 | 12 | 10 |
| **1/4" - 3"** | 50% | 20% | 70% | 70% |
| **fines** | 30% | 70% | 20% | 20% |

**Vegetation:** Some weeds and sparse trees.

**Slope:** 42 degrees

AECOM
Client: Atlantic Richfield
Project: Rico
Detail: Grid Riprap Gradations

Job No.: 60157757.300
Date Chkd:
Chkd By:

Comp. By: TAW
Date: 10-13-11
Page No.: 1

**Grid ID:** 3C.1
**Grid STA:** 36+00
**Pond:** Upstream end of Pond 18, top of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | 1 | | |
| 3" - 1' | 5 | 4 | 11 | 13 |
| 1/4" - 3" | 90% | 90% | 84% | 82% |
| fines | 5% | 5% | 5% | 5% |

**Vegetation:** Minimal vegetation in areas with some trees. Consistent coverage for reach at the top of the slope. Thicker tree vegetation than at grid location 3A and 3B.

**Slope:** 20 degrees

**Grid ID:** 3C.2
**Grid STA:** 36+00
**Pond:** Upstream end of Pond 18, bottom of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | 1 | 1 | 1 | |
| 1' - 2' | 4 | 2 | 4 | 5 |
| 3" - 1' | 8 | 11 | 6 | 11 |
| 1/4" - 3" | 20% | 10% | 5% | |
| fines | 67% | 30% | 25% veg | 40% veg |

**Vegetation:** Thicker vegetation along the toe of the riprap. Weed type vegetation growth within the riprap in cells 3 and 4 of the grid.

**Slope:** 25 degrees

**Grid ID:** 3D
**Grid STA:** 35+00
**Pond:** Adjacent to downstream end of Pond 18

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | | | |
| 3" - 1' | 1 | 2 | 6 | 2 |
| 1/4" - 3" | 84% | 83% | 74% | 78% |
| fines | 15% | 15% | 20% | 20% |

**Vegetation:** At grid location, minimal vegetation. Some shrubbery along the slope with thicker vegetation at the toe.

**Slope:** 35 degrees

**Grid ID:** 4A
**Grid STA:** 33+65
**Pond:** Adjacent to upstream end of Pond 15, top of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | | | |
| 3" - 1' | 5 | 3 | 5 | 8 |
| 1/4" - 3" | 85% | 87% | 90% | 87% |
| fines | 10% | 10% | 5% | 5% |

**Vegetation:** Minimal vegetation with some weed growth in cells 3 and 4 of the grid.

**Slope:** 35 degrees

AECOM
Client: Atlantic Richfield
Project: Rico
Detail: Grid Riprap Gradations

Job No.: 60157757.300
Date Chkd:
Chkd By:

Comp. By: TAW
Date: 10-13-11
Page No.: 1

**Grid ID:** 4B
**Grid STA:** 33+65
**Pond:** Adjacent to the upstream end of Pond 15, top of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | 1 | | | 2 |
| 1' - 2' | 1 | 3 | 1 | 3 |
| 3" - 1' | 5 | 8 | 11 | 15 |
| 1/4" - 3" | 83% | 79% | 78% | 70% |
| fines | 10% | 10% | 10% | 10% |

**Vegetation:** Minimal vegetation in riprap; however, thicker vegetation at the toe of the embankment.
**Slope:** 35 degrees

**Grid ID:** 5A
**Grid STA:** 33+55
**Pond:** Adjacent to Pond 15 near Grid 4A&B, top of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | | 2 | |
| 3" - 1' | 6 | 4 | 6 | 7 |
| 1/4" - 3" | 74% | 86% | 67% | |
| fines | 20% | 10% | 25% | 35% |

**Vegetation:** Ample amount of vegetative weed growth. More embankment material than well graded riprap for such vegetation to grow.
**Slope:** 23 degrees

**Grid ID:** 5B
**Grid STA:** 33+55
**Pond:** Adjacent to Pond 15 near Grid 4A&B, bottom of embankment slope

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | 1 | 1 | | 1 |
| 1' - 2' | 2 | 4 | 6 | 5 |
| 3" - 1' | 23 | 13 | 25 | 33 |
| 1/4" - 3" | 10% | 10% | 5% | |
| fines | 10% | 10% | | |

**Vegetation:** Minimal vegetation at the toe of the embankment. Sparse vegetation upstream and downstream of grid location.
**Slope:** 30 degrees

**Grid ID:** 6A
**Grid STA:** 31+25
**Pond:** Adjacent to Pond 15

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | | | |
| 3" - 1' | 6 | | 5 | 2 |
| 1/4" - 3" | 84% | 95% | 85% | 88% |
| fines | 10% | 5% | 10% | 10% |

**Vegetation:** Top of embankment consists of weeds and shrub type vegetation.

**Slope:** 30 degrees

AECOM

| | | |
|---|---|---|
| Client: Atlantic Richfield | Job No.: 60157757.300 | Comp. By: TAW |
| Project: Rico | Date Chkd: | Date: 10-13-11 |
| Detail: Grid Riprap Gradations | Chkd By: | Page No.: 1 |

**Grid ID:** 6B
**Grid STA:** 31+25
**Pond:** Adjacent to Pond 15

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| **2' +** | 1 | 1 | 2 | 2 |
| **1' - 2'** | 3 | 7 | 3 | 6 |
| **3" - 1'** | 6 | 3 | 5 | 5 |
| **1/4" - 3"** | | | | |
| **fines** | | | | |

**Vegetation:** Minimal vegetation in the riprap. Some weed and shrubbery vegetation at the top of riprap and below. Larger riprap in this area consisting of 1' or 2' +.
**Slope:** 20 degrees

**Grid ID:** 7A
**Grid STA:** 28+61
**Pond:** Adjacent to upstream end of Pond 14

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| **2' +** | | | | 1 |
| **1' - 2'** | 1 | | 3 | 3 |
| **3" - 1'** | 6 | 9 | 13 | 12 |
| **1/4" - 3"** | 83% | 81% | 79% | 79% |
| **fines** | 10% | 10% | 5% | 5% |

**Vegetation:** Weeds and shrubbery in the upper slope of the embankment.
**Slope:** 30 degrees

**Grid ID:** 7B
**Grid STA:** 28+-61
**Pond:** Adjacent to the upstream end of Pond 14

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| **2' +** | 1 | 2 | 1 | 1 |
| **1' - 2'** | 3 | 2 | 2 | 10 |
| **3" - 1'** | 6 | 3 | 1 | 10% |
| **1/4" - 3"** | 4 | | | |
| **fines** | Veg | | | |

**Vegetation:** Thick vegetation at the toe of the riprap.
**Slope:** 25 degrees

**Grid ID:** 7C
**Grid STA:** 27+95
**Pond:** Adjacent to the downstream end of Pond 14

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| **2' +** | | 1 | | 1 |
| **1' - 2'** | 3 | | 3 | |
| **3" - 1'** | 9 | 13 | 15 | 2 |
| **1/4" - 3"** | 50% shale | 60% shale | 70% shale | 90% shale |
| **fines** | | | | |

**Vegetation:** Some shrubbery within riprap. Thick vegetation at the toe of the riprap. Majority of the riprap are assorted sizes of broken up shale. This section proves to be different than last grid location and next rep reach.
**Slope:** 25 degrees

AECOM
Client: Atlantic Richfield
Project: Rico
Detail: Grid Riprap Gradations

Job No.: 60157757.300
Date Chkd:
Chkd By:

Comp. By: TAW
Date: 10-13-11
Page No.: 1

**Grid ID:** 8A
**Grid STA:** 26+47
**Pond:** Adjacent to the upstream end of Pond 12

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | | | |
| 3" - 1' | 5 | 4 | 10 | 5 |
| 1/4" - 3" | | | | |
| fines | 95% | 96% | 90% | 95% |

**Vegetation:** The majority of the embankment at this location has very little rock with mostly fines and weed like vegetation.
**Slope:** 30 degrees

**Grid ID:** 8B
**Grid STA:** 26+47
**Pond:** Adjacent to the upstream end of Pond 12

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | 2 | 2 | 1 | 1 |
| 1' - 2' | 2 | 3 | 2 | 4 |
| 3" - 1' | 6 | 5 | 8 | 13 |
| 1/4" - 3" | | 10% shale | | 10% shale |
| fines | | 10% void | 20% void | |

**Vegetation:** Large riprap in this area with minimal vegetation at the toe of the riprap.

**Slope:** 25 degrees

**Grid ID:** 9A
**Grid STA:** 23+72
**Pond:** In between Ponds 11 and 12

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | | | |
| 1' - 2' | | 1 | | 1 |
| 3" - 1' | 23 | 24 | 26 | 22 |
| 1/4" - 3" | 72% | 70% | 71% | 72% |
| fines | 5% | 5% | 5% | 5% |

**Vegetation:** Typical vegetation for top of slope; weeds and small bushes or shrubbery.

**Slope:** 30 degrees

**Grid ID:** 9B
**Grid STA:** 23+72
**Pond:** In between Ponds 11 and 12

| Rock Size | Grid Cell | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 2' + | | 2 | 1 | |
| 1' - 2' | 7 | 5 | 6 | 3 |
| 3" - 1' | 10 | 13 | 28 | 27 |
| 1/4" - 3" | | | | |
| fines | | | | |

**Vegetation:** Larger riprap; therefore, no vegetation in the riprap. Heavier vegetation at the top of the riprap near the river.
**Slope:** 22 degrees

AECOM
Client: Atlantic Richfield
Project: Rico
Detail: Grid Riprap Gradations

Job No.: 60157757.300
Date Chkd:
Chkd By:

Comp. By: TAW
Date: 10-13-11
Page No.: 1

**Grid ID:** E4
**Grid STA:** 21+00
**Pond:** Adjacent to the upstream end of Pond 9

| | Grid Cell | | | |
|---|---|---|---|---|
| **Rock Size** | **1** | **2** | **3** | **4** |
| **2' +** | 1 | 1 | 2 | |
| **1' - 2'** | 7 | 10 | 5 | 6 |
| **3" - 1'** | 7 | 2 | 13 | 28 |
| **1/4" - 3"** | | 20% | 20% | |
| **fines** | | | | |

**Vegetation:** Larger trees at toe of riprap near the river.

**Slope:** 20 degrees

**Grid ID:** E5
**Grid STA:** 19+50
**Pond:** At far downstream end of Pond 9

| **Rock Size** | **Grid Cell** | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **2' +** | 1 | 1 | 2 | |
| **1' - 2'** | 7 | 6 | 6 | 5 |
| **3" - 1'** | 5% | 12 | 7 | 5 |
| **1/4" - 3"** | | 20% | | |
| **fines** | | | | |

**Vegetation:** Weeds at the top of the embankment. No vegetation in the riprap, heavier bush like vegetation at the toe near the river. This grid location has larger voids with approximately 75% being filled with rocks smaller than 3" and 25% being filled with rocks larger than 3".

**Slope:** Top at 20 degrees, bottom at 40 degrees

**Grid ID:**
**Grid STA:**
**Pond:**

| **Rock Size** | **Grid Cell** | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **2' +** | | | | |
| **1' - 2'** | | | | |
| **3" - 1'** | | | | |
| **1/4" - 3"** | | | | |
| **fines** | | | | |

**Vegetation:**

**Slope:**

**Grid ID:**
**Grid STA:**
**Pond:**

| **Rock Size** | **Grid Cell** | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **2' +** | | | | |
| **1' - 2'** | | | | |
| **3" - 1'** | | | | |
| **1/4" - 3"** | | | | |
| **fines** | | | | |

**Vegetation:**

**Slope:**

# APPENDIX B3

# 100-YEAR FLOW RATE CALCULATIONS

**Project: Rico**

**Subject: Return Period Calculation Methodology Selection for Rico Watershed**

---

Purpose: Review different regression formulas and methodologies for determining 100-year return event. Select reasonable value for 100-year for use in HEC-RAS model.

Approach 1

$\boxed{Q = 213.8A^{.601}}$ CWCB regression formula for subregion DLR-1

Approach 2

$\boxed{Q_{100} = 118.4A^{.715}}$ Regression formula from USGS, "Analysis of the Magnitude and Frequency of Floods in Colorado", 2000; Southwest Region

Approach 3

$$\boxed{Q_{ungaged} = Q_{gaged}\left(\frac{A_{ungaged}}{A_{gaged}}\right)^{x}}$$

Basin translation formula from USGS, "Analysis of the Magnitude and Frequency of Floods in Colorado", 2000; Southwest Region

$$\boxed{0.5 \le \frac{A_u}{A_g} \le 1.5}$$

ratio of similar areas of gaged site to ungaged site

x = .71 for Southwest Region

in combination with Log Pearson Type 3 analysis of USGS stream gage 09165000 "Dolores River Below Rico"

Approach 4

$\boxed{Q_{100} = 10^{2.91} A^{.59} A_{7500}^{-.33}}$ Regression formula from USGS, "Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado", 2009; Southwest Region

Calculations

USGS Gage 09165000 "Dolores River Below Rico"

| | |
|---|---|
| 105.7 | Area (sqmi) |
| 2795 | Q100 per HEC-SSP (cfs) |

Dolores River at the Town of Rico

| | |
|---|---|
| 72.4 | Area (sqmi) |
| 0.68 | ratio of areas |
| 100 | Percentage area above 7500-ft |

| | | |
|---|---|---|
| | 2,804 | 1. Q100 per CWCB formula (cfs) |
| | 2,530 | 2. Q100 per USGS 2000 formula (cfs) |
| ✓ | 2,137 | 3. Q100 per USGS 2000 similar watershed formula (cfs) |
| ✓ | 2,217 | 4. Q100 per USGS 2009 formula (cfs) |
| | 2,200 | Selected Q100 for HEC-RAS model (cfs) |

**Project: Rico**
**Subject: Return Period Curve Calculation for Rico Watershed**

---

Purpose: Estimate 2, 5, 10, 25, 50, 100, 200 and 500 year return period for the Rico Watershed using USGS regression formula methodology. HEC-SSP software used to estimate return periods for downstream gaged site per Formula 3.

Formula 3

USGS, "Analysis of the Magnitude and Frequency of Floods in Colorado", 2000 Southwest Region

$$Q_{ungaged} = Q_{gaged}\left(\frac{A_{ungaged}}{A_{gaged}}\right)^{x}$$

ratio of similar areas of gaged site to ungaged site

$$0.5 \le \frac{A_u}{A_g} \le 1.5$$

area criteria

Au = area of ungaged watershed
Ag = area of gaged watershed

x = 0.71 for Southwest Region
A = 105.7 for USGS Gage 09165000 "Dolores River Below Rico (sqmi)
0.68 ratio of areas: Rico watershed / Gage 09165000 watershed

Formula 4

USGS, "Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado", 2009 Southwest Region

regression formulas for Southwest Region

$$Q_2 = 10^{1.67} A^{.64} A_{7500}^{-.10}$$
$$Q_5 = 10^{2.13} A^{.62} A_{7500}^{-.19}$$
$$Q_{10} = 10^{2.36} A^{.61} A_{7500}^{-.23}$$
$$Q_{25} = 10^{2.61} A^{.60} A_{7500}^{-.27}$$
$$Q_{50} = 10^{2.77} A^{.59} A_{7500}^{-.30}$$
$$Q_{100} = 10^{2.91} A^{59} A_{7500}^{-.33}$$
$$Q_{200} = 10^{3.04} A^{58} A_{7500}^{-.36}$$
$$Q_{500} = 10^{3.21} A^{.58} A_{7500}^{-.39}$$

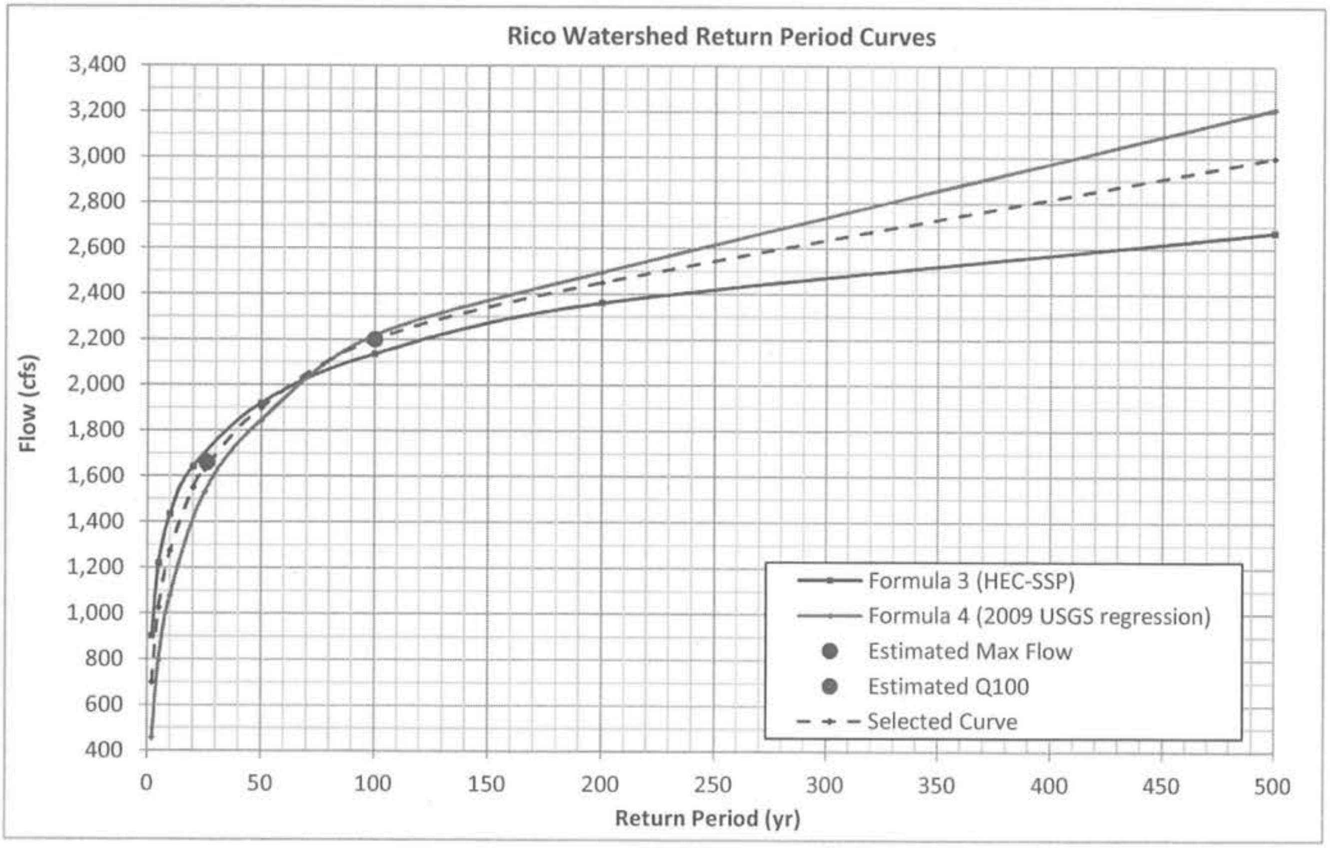
A = 72.4 for Rico watershed (sqmi)
A7500 = 100 %age of Rico watershed above 7500-ft

**Project: Rico**

**Subject: Return Period Curve Calculation for Rico Watershed**

Output

|  |  |  | Rico Watershed |  |  |
|---|---|---|---|---|---|
|  | Return Period (yr) | Gage Q (cfs) | Formula 3 Q (cfs) | Formula 4 Q (cfs) | Selected Q (cfs) |
| Q2 | 2 | 1,181 | 903 | 457 | 700 |
| Q5 | 5 | 1,596 | 1,220 | 798 | 1,025 |
| Q10 | 10 | 1,876 | 1,434 | 1,080 | 1,275 |
| Q20 | 20 | 2,148 | 1,642 |  | 1,550 |
| Q25 | 25 |  |  | 1,530 | 1,630 |
| Q50 | 50 | 2,512 | 1,920 | 1,845 | 1,900 |
| Q100 | 100 | 2,795 | 2,137 | 2,217 | 2,200 |
| Q200 | 200 | 3,089 | 2,361 | 2,495 | 2,450 |
| Q500 | 500 | 3,496 | 2,672 | 3,213 | 3,000 |
|  |  |  |  |  |  |
| Max Gage Flow since 1981 | 26 | 2,170 | 1,659 | NA | 1,660 |



CWCB

## 7.0 DOLORES RIVER BASIN

The CWCB recommends that approximate peak flow values for this all watersheds within the Dolores River basin be computed using the USGS publication entitled U.S. Geological Survey in cooperation with the Colorado Department of Transportation and the Bureau of Land Management, Analysis of the Magnitude and Frequency of Floods in Colorado, Water Resources Investigations Report 99-4190, 2000.

**For information purposes only, the CWCB has included the following equation for the Dolores River basin that can be used for comparison of peak flow values at a site of interest.**

Hydrology data from detailed floodplain analyses were obtained and analyzed for the Dolores River basin. The Dolores River basin was not divided into subregions. A description of the Dolores River region along with the associated regression equation and application criteria are presented below. A hydrologic regions map showing the regional and subregional boundaries for Colorado is available on-line as a separate PDF file.

### DLR-1: DOLORES RIVER SUBREGION

This subregion includes the Dolores River mainstem and its tributaries in southwestern Colorado. Streams in this subregion are located in portions of Dolores County, San Miguel County, Montrose County, and Mesa County. Major tributaries in this subregion include the San Miguel River, Naturita Creek, and West Dolores River. The subregion is bounded as follows:

- On the north by the Dolores River - Colorado River basin divide;
- On the east by the Dolores River - Gunnison River basin divide;
- On the south by the Dolores River - San Juan River basin divide; and
- On the west by the Colorado - Utah state line.

*The regression equation for this subregion is only valid for natural tributary streams that have drainage areas between 2 $mi^2$ and 1,080 $mi^2$. A detailed study or other hydrologic analysis must be performed for projects involving streams with drainage areas that fall outside of the applicable range.*

The equation for subregion DLR-1 is:

A = 72.4 sq mi

$$Q = 213.8(A)^{.601}$$

Q = 2803 cfs

Where:

A = Drainage Area, square miles (2<A<1,080)
Q = 100 year peak flow, cfs

# Analysis of the Magnitude and Frequency of Floods in Colorado

By J.E. Vaill

---

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 99–4190

Prepared in cooperation with the
COLORADO DEPARTMENT OF TRANSPORTATION
and the BUREAU OF LAND MANAGEMENT

Denver, Colorado
2000

**Table 1.** Regional flood-frequency equations, Colorado

[$Q$, discharge, in cubic feet per second; $A$, drainage area, in square miles; $P$, mean annual precipitation, in inches; $S$, mean drainage-basin slope, in foot per foot]

| Recurrence interval, in years | Regression equation | Standard error of the model, in percent | Average standard error of prediction, in percent |
|---|---|---|---|
| Mountain region | | | |
| 2 | $Q = 11.0\,(A)^{0.663}\,(S + 1.0)^{3.465}$ | 58.5 | 59.6 |
| 5 | $Q = 17.9\,(A)^{0.677}\,(S + 1.0)^{2.739}$ | 47.7 | 48.6 |
| 10 | $Q = 23.0\,(A)^{0.685}\,(S + 1.0)^{2.364}$ | 43.7 | 44.6 |
| 25 | $Q = 29.4\,(A)^{0.695}\,(S + 1.0)^{2.004}$ | 41.4 | 42.3 |
| 50 | $Q = 34.5\,(A)^{0.700}\,(S + 1.0)^{1.768}$ | 41.4 | 42.3 |
| 100 | $Q = 39.5\,(A)^{0.706}\,(S + 1.0)^{1.577}$ | 42.4 | 43.4 |
| 200 | $Q = 44.6\,(A)^{0.710}\,(S + 1.0)^{1.408}$ | 44.2 | 45.2 |
| 500 | $Q = 51.5\,(A)^{0.715}\,(S + 1.0)^{1.209}$ | 47.5 | 48.6 |
| Rio Grande region | | | |
| 2 | $Q = 0.03\,(A)^{0.979}\,(P)^{1.615}$ | 77.7 | 82.6 |
| 5 | $Q = 0.12\,(A)^{0.940}\,(P)^{1.384}$ | 64.0 | 67.9 |
| 10 | $Q = 0.25\,(A)^{0.914}\,(P)^{1.277}$ | 58.2 | 89.1 |
| 25 | $Q = 0.52\,(A)^{0.884}\,(P)^{1.117}$ | 53.4 | 56.8 |
| 50 | $Q = 0.81\,(A)^{0.864}\,(P)^{1.121}$ | 51.2 | 54.5 |
| 100 | $Q = 1.19\,(A)^{0.846}\,(P)^{1.074}$ | 49.9 | 53.3 |
| 200 | $Q = 1.67\,(A)^{0.828}\,(P)^{1.036}$ | 49.5 | 52.9 |
| 500 | $Q = 2.48\,(A)^{0.808}\,(P)^{0.995}$ | 50.0 | 53.6 |
| Southwest region | | | |
| 2 | $Q = 28.7\,(A)^{0.699}$ | 85.0 | 87.3 |
| 5 | $Q = 50.5\,(A)^{0.693}$ | 74.1 | 76.1 |
| 10 | $Q = 66.0\,(A)^{0.697}$ | 71.4 | 73.4 |
| 25 | $Q = 86.3\,(A)^{0.704}$ | 71.2 | 73.4 |
| 50 | $Q = 102.0\,(A)^{0.709}$ | 72.8 | 75.0 |
| 100 | $Q = 118.4\,(A)^{0.715}$ | 75.6 | 78.0 |
| 200 | $Q = 135.5\,(A)^{0.720}$ | 79.1 | 81.7 |
| 500 | $Q = 159.4\,(A)^{0.728}$ | 85.0 | 87.9 |
| Northwest region | | | |
| 2 | $Q = 0.39\,(A)^{0.684}\,(P)^{1.304}$ | 82.6 | 85.6 |
| 5 | $Q = 2.84\,(A)^{0.674}\,(P)^{0.833}$ | 71.5 | 74.0 |
| 10 | $Q = 7.56\,(A)^{0.671}\,(P)^{0.601}$ | 68.5 | 70.9 |
| 25 | $Q = 20.6\,(A)^{0.669}\,(P)^{0.362}$ | 67.1 | 69.7 |
| 50 | $Q = 38.8\,(A)^{0.667}\,(P)^{0.210}$ | 67.2 | 69.8 |
| 100 | $Q = 104.7\,(A)^{0.624}$ | 75.0 | 76.7 |
| 200 | $Q = 118.5\,(A)^{0.624}$ | 77.8 | 79.6 |
| 500 | $Q = 137.6\,(A)^{0.623}$ | 83.1 | 85.1 |
| Plains region | | | |
| 2 | $Q = 39.0\,(A)^{0.486}$ | 233.7 | 258.5 |
| 5 | $Q = 195.8\,(A)^{0.399}$ | 204.2 | 223.8 |
| 10 | $Q = 364.6\,(A)^{0.400}$ | 212.4 | 233.7 |
| 25 | $Q = 725.3\,(A)^{0.395}$ | 231.8 | 256.2 |
| 50 | $Q = 1116\,(A)^{0.392}$ | 249.5 | 278.3 |
| 100 | $Q = 1640\,(A)^{0.388}$ | 267.3 | 300.0 |
| 200 | $Q = 2324\,(A)^{0.385}$ | 284.5 | 321.3 |
| 500 | $Q = 3534\,(A)^{0.380}$ | 305.8 | 347.9 |

interval of interest is selected, a weighted estimate of the peak discharge can be computed for a site using the regression equation for the appropriate region and the peak-discharge value from the flood-frequency curve.

Weighted estimates are used for unregulated streams to reduce the time-sampling error that may occur in a station flood-frequency estimate. This time-sampling error is associated with the length of record for a gaging station. A station with a short period of record may have a large time-sampling error because its record may not be representative of the actual flood history of the site based on a large number of years. The observed period of record has the possibility of falling within a wet or dry climatic cycle. The weighted estimate of flood frequency should be a better indicator of the true value because the regression estimate is an average of the flood histories of many gaging stations over a long period of time (Thomas and Lindskov, 1983).

**Table 2.** Basin characteristics and the range of values used in the analysis

| Basin characteristics | Range of values |
|---|---|
| Drainage-basin area, in square miles | 5.5 to 988.0 |
| Mean annual precipitation, in inches | 7.0 to 49.0 |
| Mean drainage-basin elevation, in feet | 2.805 to 12,200 |
| Mean drainage-basin slope, in foot per foot | 0.081 to 0.562 |

## Sites near Gaging Stations on the Same Stream

Peak discharges for sites near gaging stations on the same stream can be estimated by using a ratio of drainage area for the sites near the ungaged sites and the gaged sites. This method is considered to be reliable when the drainage-area ratio is between about 0.5 and 1.5 and when the two sites have similar drainage-basin and climatic characteristics. If the sites of interest have similar basin and climatic characteristics and meet the drainage-area-ratio requirement, peak discharges can be computed by the following equation:

$$Q_{T(u)} = Q_{T(g)}(A_u/A_g)^x, \qquad (3)$$

where

$Q_{T(u)}$ is the peak discharge, in cubic feet per second, at the ungaged site for T-year recurrence interval;

$Q_{T(g)}$ is the weighted peak discharge, in cubic feet per second, at the gaged site for T-year recurrence interval;

$A_u$ is the drainage area, in square miles, at the ungaged site;

$A_g$ is the drainage area, in square miles, at the gaged site; and

$x$ is the average exponent for drainage area for each flood region as follows:

| Flood region | Exponent |
|---|---|
| Mountains | 0.69 |
| Rio Grande | 0.88 |
| Southwest | 0.71 |
| Northwest | 0.64 |
| Plains | 0.40 |

The following is an example calculation to determine the 100-year peak discharge for an ungaged site near a gaged site on the same stream in the mountain region. The drainage area at the ungaged site is given as 350 mi$^2$ and at the gaged site is 450 mi$^2$. The weighted discharge for the 100-year peak at the gaged site is given as 11,500 ft$^3$/s.

1. Check that the drainage area ratio $A_u/A_g$ is between 0.5 and 1.5. That ratio is as follows:

$$A_u/A_g = 350/450 = 0.78$$

which meets the ratio requirement.

2. Compute the discharge at the ungaged site using the specified values in equation 3:

$$Q_{100(u)} = 11,500(350/450)^{0.69} = 9,670 \text{ ft}^3/\text{s}.$$

## Ungaged Sites

Peak discharges at ungaged sites can be computed using the appropriate regional equation shown in table 1. For sites on streams that cross regional boundaries, results from more than one of the regional equations need to be weighted as described below.

# Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado

By Joseph P. Capesius and Verlin C. Stephens

Prepared in cooperation with the Colorado Water Conservation Board and the Colorado Department of Transportation

Scientific Investigations Report 2009–5136

**U.S. Department of the Interior**
**U.S. Geological Survey**

### Peak Streamflow Equations for Southwest Region

Generalized least-squares (GLS) regression, 78 stations
Approximate range of predictor variables

$A$: 1–4,390 square miles and $A_{7500}$: 0–100 percent

$Q_2 = 10^{1.67} A^{0.64} A_{7500}^{-0.10}$ ☑ $SEP = 90$, pseudo$R^2 = 70$, $SME = 87$,
$Q_5 = 10^{2.13} A^{0.62} A_{7500}^{-0.19}$ ☑ $SEP = 71$, pseudo$R^2 = 75$, $SME = 69$,
$Q_{10} = 10^{2.36} A^{0.61} A_{7500}^{-0.23}$ ☑ $SEP = 67$, pseudo$R^2 = 77$, $SME = 64$,
$Q_{25} = 10^{2.61} A^{0.60} A_{7500}^{-0.27}$ ☑ $SEP = 66$, pseudo$R^2 = 78$, $SME = 63$,
$Q_{50} = 10^{2.77} A^{0.59} A_{7500}^{-0.30}$ ☑ $SEP = 67$, pseudo$R^2 = 78$, $SME = 63$,
$Q_{100} = 10^{2.91} A^{0.59} A_{7500}^{-0.33}$ ☑ $SEP = 69$, pseudo$R^2 = 78$, $SME = 65$,
$Q_{200} = 10^{3.04} A^{0.58} A_{7500}^{-0.36}$ ☑ $SEP = 71$, pseudo$R^2 = 77$, $SME = 67$, and
$Q_{500} = 10^{3.21} A^{0.58} A_{7500}^{-0.39}$ ☑ $SEP = 75$, pseudo$R^2 = 77$, $SME = 70$.

### Minimum Streamflow for Southwest Region

Generalized least-squares (GLS) regression, 46, 37, and 33 stations
Approximate range of predictor variables

$A$: 4–4,390 square miles, $P$: 10–51 inches, $E$: 5,600–11,600 feet

${}_7Q_2^{\min} = 10^{-22.24} A^{1.16} P^{1.51} E^{4.65}$ ☑ $SEP = 226$, pseudo$R^2 = 67$, $SME = 207$,
${}_7Q_{10}^{\min} = 10^{-18.74} A^{0.97} P^{1.35} E^{3.88}$ ☑ $SEP = 255$, pseudo$R^2 = 52$, $SME = 226$, and
${}_7Q_{50}^{\min} = 10^{-26.29} A^{0.49} P^{0.11} E^{6.45}$ ☑ $SEP = 354$, pseudo$R^2 = 33$, $SME = 300$.

### Maximum Streamflow for Southwest Region

Generalized least-squares (GLS) regression, 59 stations
Approximate range of predictor variables

$A$: 4–4,390 square miles and $P$: 10–51 inches

${}_7Q_2^{\max} = 10^{-4.07} A^{0.99} P^{3.10}$ ☑ $SEP = 64$, pseudo$R^2 = 88$, $SME = 61$,
${}_7Q_{10}^{\max} = 10^{-2.68} A^{0.93} P^{2.44}$ ☑ $SEP = 43$, pseudo$R^2 = 93$, $SME = 40$, and
${}_7Q_{50}^{\max} = 10^{-1.86} A^{0.89} P^{2.03}$ ☑ $SEP = 33$, pseudo$R^2 = 95$, $SME = 30$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

**Figure 6.** Regional regression equations for the Southwest hydrologic region.

```
-------------------------------
Bulletin 17B Frequency Analysis
    06 Dec 2011   11:22 AM
-------------------------------


--- Input Data ---

Analysis Name: USGS Gage 09165000
Description:

Data Set Name: DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
DSS File Name: Z:\_CURRENT_PROJECTS\Atlantic Richfield\60157757 Rico\400
Technical\405_HH\watershed\HEC-SSP\Rico_Gage_Frequency_Analysis.dss
DSS Pathname: /DOLORES RIVER/RICO, CO./FLOW-ANNUAL PEAK/01jan1900/IR-
CENTURY/USGS/

Report File Name: Z:\_CURRENT_PROJECTS\Atlantic Richfield\60157757
Rico\400 Technical\405_HH\watershed\HEC-
SSP\Bulletin17bResults\USGS_Gage_09165000\USGS_Gage_09165000.rpt
XML File Name: Z:\_CURRENT_PROJECTS\Atlantic Richfield\60157757 Rico\400
Technical\405_HH\watershed\HEC-
SSP\Bulletin17bResults\USGS_Gage_09165000\USGS_Gage_09165000.xml

Start Date:
End Date:

Skew Option: Use Station Skew
Regional Skew: -0.1
Regional Skew MSE: 0.302

Plotting Position Type: Median

Upper Confidence Level: 0.05
Lower Confidence Level: 0.95

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---


--- Preliminary Results ---


<< Skew Weighting >>
-----------------------------------------------------------------
Based on 57 events, mean-square error of station skew =     0.295
Mean-square error of regional skew =                        0.302
-----------------------------------------------------------------


<< Frequency Curve >>
DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
-------------------------------------------------------------------
```

```
| Computed    Expected   |   Percent    |    Confidence Limits    |
|  Curve    Probability  |   Chance     |     0.05         0.95   |
|     FLOW, CFS          | Exceedance   |      FLOW, CFS          |
|------------------------|--------------|-------------------------|
|     2,138.3    2,148.0 |     0.2      |    2,507.9     1,881.4  |
|     2,110.9    2,121.2 |     0.5      |    2,471.4     1,859.4  |
|     2,079.6    2,090.8 |     1.0      |    2,430.0     1,834.2  |
|     2,034.7    2,045.7 |     2.0      |    2,370.5     1,797.8  |
|     1,942.5    1,953.3 |     5.0      |    2,249.6     1,722.8  |
|     1,833.0    1,840.8 |    10.0      |    2,107.6     1,632.7  |
|     1,665.1    1,670.2 |    20.0      |    1,893.7     1,492.3  |
|     1,258.6    1,258.6 |    50.0      |    1,399.4     1,137.8  |
|       818.1      810.6 |    80.0      |      910.0       723.7  |
|       610.4      598.0 |    90.0      |      692.7       521.6  |
|       461.6      445.7 |    95.0      |      538.2       378.7  |
|       248.5      226.5 |    99.0      |      311.1       184.1  |
|------------------------|--------------|-------------------------|


<< Systematic Statistics >>
DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
---------------------------------------------------------------
|        Log Transform:         |                               |
|          FLOW, CFS            |       Number of Events        |
|-------------------------------|-------------------------------|
| Mean                   3.054  | Historic Events           0   |
| Standard Dev           0.201  | High Outliers          0      |
| Station Skew          -1.410  | Low Outliers           0      |
| Regional Skew         -0.100  | Zero Events            0      |
| Weighted Skew         -0.763  | Missing Events         0      |
| Adopted Skew          -1.410  | Systematic Events        57   |
|-------------------------------|-------------------------------|

--- End of Preliminary Results ---



----------------------
<< Low Outlier Test >>
----------------------
 Based on 57 events, 10 percent outlier test deviate K(N) = 2.818
                         Computed low outlier test value = 307.38

          2 low outlier(s) identified below test value of 307.38


     Statistics and frequency curve adjusted for 2 low outlier(s)


<< Systematic Statistics >>
DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
---------------------------------------------------------------
|        Log Transform:         |                               |
```

```
|          FLOW, CFS             |       Number of Events         |
|--------------------------------|--------------------------------|
| Mean                  3.080    | Historic Events           0    |
| Standard Dev          0.151    | High Outliers          0       |
| Station Skew          0.035    | Low Outliers           2       |
| Regional Skew        -0.100    | Zero Events            0       |
| Weighted Skew        -0.763    | Missing Events         0       |
| Adopted Skew         -1.410    | Systematic Events        57    |
|--------------------------------|--------------------------------|


-----------------------
<< High Outlier Test >>
-----------------------
 Based on 55 events, 10 percent outlier test deviate K(N) = 2.804
                      Computed high outlier test value = 3,181.42

       0 high outlier(s) identified above test value of 3,181.42


Note: Statistics and frequency curve were modified
using conditional probablity adjustment.




--- Final Results ---

<< Plotting Positions >>
DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
--------------------------------------------------------------------
|     Events Analyzed          |           Ordered Events          |
|                        FLOW  |           Water      FLOW  Median |
| Day Mon Year            CFS  |  Rank      Year       CFS Plot Pos |
|------------------------------|-----------------------------------|
|  10 Jun 1952       2,120.0   |    1       1984    2,170.0   1.22 |
|  28 May 1953       1,460.0   |    2       1995    2,140.0   2.96 |
|  21 May 1954         786.0   |    3       1952    2,120.0   4.70 |
|  08 Jun 1955       1,360.0   |    4       1957    2,080.0   6.45 |
|  31 May 1956       1,020.0   |    5       2005    2,040.0   8.19 |
|  05 Jun 1957       2,080.0   |    6       1970    1,930.0   9.93 |
|  27 May 1958       1,900.0   |    7       1958    1,900.0  11.67 |
|  15 May 1959         585.0   |    8       2007    1,840.0  13.41 |
|  03 Jun 1960       1,170.0   |    9       1985    1,830.0  15.16 |
|  19 May 1961       1,020.0   |   10       1973    1,810.0  16.90 |
|  09 May 1962       1,190.0   |   11       1980    1,770.0  18.64 |
|  08 May 1963         867.0   |   12       1975    1,620.0  20.38 |
|  26 May 1964       1,220.0   |   13       1982    1,610.0  22.13 |
|  21 May 1965       1,330.0   |   14       1979    1,600.0  23.87 |
|  09 May 1966         951.0   |   15       1986    1,590.0  25.61 |
|  21 May 1967         769.0   |   16       1983    1,590.0  27.35 |
|  04 Jun 1968       1,360.0   |   17       2008    1,500.0  29.09 |
|  30 May 1969       1,210.0   |   18       1993    1,490.0  30.84 |
```

```
|  06 Sep 1970      1,930.0  |    19        1953      1,460.0   32.58   |
|  17 Jun 1971      1,100.0  |    20        2009      1,400.0   34.32   |
|  08 Jun 1972        776.0  |    21        1968      1,360.0   36.06   |
|  11 Jun 1973      1,810.0  |    22        1955      1,360.0   37.80   |
|  10 May 1974        783.0  |    23        1978      1,330.0   39.55   |
|  05 Jun 1975      1,620.0  |    24        1965      1,330.0   41.29   |
|  04 Jun 1976        958.0  |    25        2010      1,310.0   43.03   |
|  09 May 1977        270.0  |    26        1964      1,220.0   44.77   |
|  10 Jun 1978      1,330.0  |    27        1969      1,210.0   46.52   |
|  13 Jun 1979      1,600.0  |    28        1962      1,190.0   48.26   |
|  10 Jun 1980      1,770.0  |    29        1960      1,170.0   50.00   |
|  07 Jun 1981        878.0  |    30        1987      1,150.0   51.74   |
|  25 Aug 1982      1,610.0  |    31        1971      1,100.0   53.48   |
|  19 Jun 1983      1,590.0  |    32        1996      1,060.0   55.23   |
|  24 May 1984      2,170.0  |    33        1961      1,020.0   56.97   |
|  08 Jun 1985      1,830.0  |    34        1956      1,020.0   58.71   |
|  06 Jun 1986      1,590.0  |    35        2003      1,000.0   60.45   |
|  09 Jun 1987      1,150.0  |    36        2004        994.0   62.20   |
|  06 Jun 1988        764.0  |    37        1994        980.0   63.94   |
|  10 May 1989        644.0  |    38        1976        958.0   65.68   |
|  05 Jun 1990        938.0  |    39        1966        951.0   67.42   |
|  20 May 1991        794.0  |    40        1990        938.0   69.16   |
|  20 May 1992        866.0  |    41        2001        923.0   70.91   |
|  16 Jun 1993      1,490.0  |    42        1999        923.0   72.65   |
|  03 Jun 1994        980.0  |    43        1981        878.0   74.39   |
|  17 Jun 1995      2,140.0  |    44        1963        867.0   76.13   |
|  16 May 1996      1,060.0  |    45        1992        866.0   77.87   |
|  17 Jun 1999        923.0  |    46        2000        831.0   79.62   |
|  24 May 2000        831.0  |    47        1991        794.0   81.36   |
|  15 May 2001        923.0  |    48        1954        786.0   83.10   |
|  14 Apr 2002        187.0  |    49        1974        783.0   84.84   |
|  27 May 2003      1,000.0  |    50        1972        776.0   86.59   |
|  19 May 2004        994.0  |    51        2006        769.0   88.33   |
|  23 May 2005      2,040.0  |    52        1967        769.0   90.07   |
|  22 May 2006        769.0  |    53        1988        764.0   91.81   |
|  06 Oct 2006      1,840.0  |    54        1989        644.0   93.55   |
|  20 May 2008      1,500.0  |    55        1959        585.0   95.30   |
|  13 May 2009      1,400.0  |    56        1977        270.0*  97.04   |
|  28 May 2010      1,310.0  |    57        2002        187.0*  98.78   |
|----------------------------|-----------------------------------------|
                                                              * Outlier


<< Skew Weighting >>
-------------------------------------------------------------------------
Based on 57 events, mean-square error of station skew =           0.094
Mean-square error of regional skew =                              0.302
-------------------------------------------------------------------------


<< Frequency Curve >>
DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
---------------------------------------------------------------------------
```

```
|  Computed    Expected  |  Percent     |   Confidence Limits    |
|   Curve    Probability |  Chance      |      0.05        0.95  |
|       FLOW, CFS        | Exceedance   |       FLOW, CFS        |
|------------------------|--------------|------------------------|
|     3,308.8    3,496.0 |     0.2      |    4,067.6     2,832.0 |
|     2,963.0    3,088.9 |     0.5      |    3,575.9     2,569.2 |
|     2,706.0    2,795.4 |     1.0      |    3,217.6     2,370.9 |
|     2,451.7    2,512.2 |     2.0      |    2,869.5     2,171.5 |
|     2,115.8    2,148.2 |     5.0      |    2,421.4     1,902.7 |
|     1,857.7    1,875.5 |    10.0      |    2,087.4     1,690.5 |
|     1,588.4    1,596.2 |    20.0      |    1,751.3     1,461.7 |
|     1,180.6    1,180.6 |    50.0      |    1,275.3     1,092.7 |
|       880.8      876.6 |    80.0      |      957.1       798.7 |
|       756.8      750.0 |    90.0      |      831.5       673.8 |
|       668.3      658.7 |    95.0      |      742.5       584.7 |
|       530.1      514.4 |    99.0      |      603.5       447.5 |
|------------------------|--------------|------------------------|


<< Synthetic Statistics >>
DOLORES RIVER-RICO, CO.-FLOW-ANNUAL PEAK
----------------------------------------------------------------
|        Log Transform:         |                               |
|          FLOW, CFS            |      Number of Events         |
|-------------------------------|-------------------------------|
|  Mean                   3.073 |  Historic Events            0 |
|  Standard Dev           0.152 |  High Outliers           0    |
|  Station Skew           0.046 |  Low Outliers            2    |
|  Regional Skew         -0.100 |  Zero Events             0    |
|  Weighted Skew          0.011 |  Missing Events          0    |
|  Adopted Skew           0.046 |  Systematic Events        57  |
|-------------------------------|-------------------------------|

--- End of Analytical Frequency Curve ---
```

# APPENDIX B4
# MANNING'S 'N' CALCULATIONS

ATLANTIC RICHFIELD - RICO
Manning's "n" Roughness Development
8-Nov-11

## HEC-RAS Manning's Roughness Coefficients

### References

USGS - Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains
Chow - Open Channel Hydraulics

### Approach

HEC-RAS development (calculations completed in this spreadsheet)
- Develop Manning's "n" utilizing USGS guidelines.
- Cross compare with Manning's "n" description in "Open Channel Hydraulics" by Chow.

HEC-RAS calibration (to be completed in HEC-RAS)
- Adjust Manning's "n" in HEC-RAS model to achieve stable model if required.

### Summary of Results

| Main Channel | |
|---|---|
| "n" | Description |
| 0.050 | main channel, very rocky, some meandering |

| Banks | |
|---|---|
| "n" | Description |
| 0.200 | 1) super thick 2-5 foot tall brush, many 5-30 foot tall leafy trees, pic #0022, 0035 & 0119 |
| 0.180 | 2a) thick 2-5 foot tall brush, many 5-30 foot tall leafy trees |
| | 2b) super thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees |
| 0.160 | 3) thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees |
| 0.140 | 4a) thick 2-5 foot tall brush, intermittent trees, pic #0054 |
| | 4b) some to moderate 2-5 foot tall brush, many 5-30 foot tall leafy trees |
| | 4c) some to moderate 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees |
| 0.130 | 5) some to moderate 2-5 foot tall brush, tall grasses, intermittent trees |
| 0.110 | 6a) gravel 3/8 - 2 in base, some to mod 0.5-2 ft tall brush/grass, some to mod 5-20 ft tall leafy trees |
| | 6b) thick course riprap up to 24", well graded, some vegetation (ASSUMED future condition) |
| 0.080 | 7a) gravel 3/8 - 2 inch base, intermittent 5 - 10 foot tall leafy trees |
| | 7b) gravel 3/8 - 2 inch base, some to moderate 0.5-2 foot tall brush/grass, no trees |
| 0.060 | 8) gravel 3/8 - 2 inch road, no vegetation |
| 0.040 | 9a) shallow water - settling ponds - bare dirt bottom |
| | 9b) paved road |

ATLANTIC RICHFIELD - RICO
Manning's "n" Roughness Development
8-Nov-11

## HEC-RAS Manning's Roughness Coefficients

**Calculations**

$$n = (n_b + n_1 + n_2 + n_3 + n_4)m$$

MAIN CHANNEL

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | All Stations | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.030 | 0.050 | 0.035 | Cobble | gravel/cobble base, 1 - 4 inch |
| Irregularity, n1 | 0.001 | 0.005 | 0.005 | Minor | generally good condition, some erosion on side slopes |
| Variation, n2 | 0.001 | 0.005 | 0.005 | Alternating occasionally | little variation in main creek bed, occasional shifting and geometry change |
| Obstruction, n3 | 0.000 | 0.004 | 0.000 | Negligible | little to no obstruction in main creek bed, less than 5% of section |
| Vegetation, n4 | 0.001 | 0.010 | 0.004 | Small | little vegetation in the main creek bed |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering; river banks are controlled |
| Computed "n" | 0.033 | 0.074 | 0.049 | | |
| | | | 0.050 | Selected "n" | |

CHANNEL BANKS

Number of different Manning's "n" roughness designations for the banks

1 super thick 2-5 foot tall brush, many 5-30 foot tall leafy trees, pic #0022, 0035 & 0119
2 a thick 2-5 foot tall brush, many 5-30 foot tall leafy trees
b super thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees
3 thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees
4 a thick 2-5 foot tall brush, intermittent trees, pic #0054
b some to moderate 2-5 foot tall brush, many 5-30 foot tall leafy trees
c some to moderate 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees
5 some to moderate 2-5 foot tall brush, tall grasses, intermittent trees
6 a gravel 3/8 - 2 in base, some to mod 0.5-2 ft tall brush/grass, some to mod 5-20 ft tall leafy trees
b thick course riprap up to 24", well graded, some vegetation (ASSUMED future condition)
7 a gravel 3/8 - 2 inch base, intermittent 5 - 10 foot tall leafy trees
b gravel 3/8 - 2 inch base, some to moderate 0.5-2 foot tall brush/grass, no trees
8 gravel 3/8 - 2 inch road, no vegetation
9 a shallow water - settling ponds - bare dirt bottom
b paved road

Roughness Designation: 1 super thick 2-5 foot tall brush, many 5-30 foot tall leafy trees, pic #0022, 0035 & 0119

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.040 | 0.050 | 0.050 | Severe | thick with trees and tall bushes |
| Vegetation, n4 | 0.050 | 0.100 | 0.100 | Very Large | significant undergrowth - ground barely visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.126 | 0.202 | 0.200 | | |
| | | | 0.200 | Selected "n" | |

ATLANTIC RICHFIELD - RICO
Manning's "n" Roughness Development
8-Nov-11

## HEC-RAS Manning's Roughness Coefficients

Roughness Designation: 2a thick 2-5 foot tall brush, many 5-30 foot tall leafy trees

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.040 | 0.050 | 0.050 | Severe | many 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.080 | Very Large | thick undergrowth - ground somewhat visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.126 | 0.202 | 0.180 | | |
| | | | 0.180 | Selected "n" | |

Roughness Designation: 2b super thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.020 | 0.030 | 0.025 | Appreciable | some to moderate 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.100 | Very Large | significant undergrowth - ground barely visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.106 | 0.182 | 0.175 | | |
| | | | 0.180 | Selected "n" | |

Roughness Designation: 3 thick 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.020 | 0.030 | 0.025 | Appreciable | some to moderate 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.080 | Very Large | thick undergrowth - ground somewhat visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.106 | 0.182 | 0.155 | | |
| | | | 0.160 | Selected "n" | |

ATLANTIC RICHFIELD - RICO
Manning's "n" Roughness Development
8-Nov-11

## HEC-RAS Manning's Roughness Coefficients

Roughness Designation: 4a thick 2-5 foot tall brush, intermittent trees, pic #0054

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.005 | 0.015 | 0.010 | Minor | intermittent 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.080 | Very Large | thick undergrowth - ground somewhat visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.091 | 0.167 | 0.140 | | |
| | | | 0.140 | Selected "n" | |

Roughness Designation: 4b some to moderate 2-5 foot tall brush, many 5-30 foot tall leafy trees

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.020 | 0.030 | 0.025 | Appreciable | some to moderate 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.060 | Very Large | some to moderate 2-5 ft tall brush, ground somewhat visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.106 | 0.182 | 0.135 | | |
| | | | 0.140 | Selected "n" | |

Roughness Designation: 4c some to moderate 2-5 foot tall brush, some to moderate 5-30 foot tall leafy trees

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.020 | 0.030 | 0.025 | Appreciable | some to moderate 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.060 | Very Large | some to moderate 2-5 ft tall brush, ground somewhat visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.106 | 0.182 | 0.135 | | |
| | | | 0.140 | Selected "n" | |

ATLANTIC RICHFIELD - RICO
Manning's "n" Roughness Development
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## HEC-RAS Manning's Roughness Coefficients

Roughness Designation: 5 some to moderate 2-5 foot tall brush, tall grasses, intermittent trees

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.032 | Firm Soil | Firm soil base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.005 | 0.015 | 0.010 | Minor | intermittent 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.050 | 0.100 | 0.060 | Very Large | some to moderate 2-5 ft tall brush, ground somewhat visible |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.091 | 0.167 | 0.120 | | |
| | | | 0.130 | Selected "n" | |

Roughness Designation: 6a gravel 3/8 - 2 in base, some to mod 0.5-2 ft tall brush/grass, some to mod 5-20 ft tall lea

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.028 | 0.035 | 0.032 | Gravel | 3/8 - 2-in gravel base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.020 | 0.030 | 0.025 | Appreciable | some to moderate 5-30 foot tall, leafy trees |
| Vegetation, n4 | 0.025 | 0.050 | 0.035 | Large | some to moderate shrub & grass |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.084 | 0.135 | 0.110 | | |
| | | | 0.110 | Selected "n" | |

Roughness Designation: 6b thick course riprap up to 24", well graded, some vegetation (ASSUMED future condition)

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.040 | 0.070 | 0.055 | Boulder | thick riprap up to 24", well graded |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.000 | 0.004 | 0.000 | Negligible | no obstructions |
| Vegetation, n4 | 0.025 | 0.050 | 0.035 | Large | some to moderate shrub & grass (assumed) |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.076 | 0.144 | 0.108 | | |
| | | | 0.110 | Selected "n" | |

## HEC-RAS Manning's Roughness Coefficients

Roughness Designation: 7a gravel 3/8 - 2 inch base, intermittent 5 - 10 foot tall leafy trees

| | | | | | |
|---|---|---|---|---|---|
| River | Dolores River | | | | |
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.028 | 0.035 | 0.032 | Gravel | 3/8 - 2-in gravel base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.005 | 0.015 | 0.010 | Minor | intermittent 5-10 foot tall, leafy trees |
| Vegetation, n4 | 0.010 | 0.025 | 0.020 | Medium | 3/8 - 2-in gravel road base |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.054 | 0.095 | 0.080 | | |
| | | | 0.080 | Selected "n" | |

Roughness Designation: 7b gravel 3/8 - 2 inch base, some to moderate 0.5-2 foot tall brush/grass, no trees

| | | | | | |
|---|---|---|---|---|---|
| River | Dolores River | | | | |
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.028 | 0.035 | 0.032 | Gravel | 3/8 - 2-in gravel base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.000 | 0.004 | 0.000 | Negligible | no obstructions |
| Vegetation, n4 | 0.025 | 0.050 | 0.035 | Large | some to moderate shrub & grass |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.064 | 0.109 | 0.085 | | |
| | | | 0.080 | Selected "n" | |

Roughness Designation: 8 gravel 3/8 - 2 inch road, no vegetation

| | | | | | |
|---|---|---|---|---|---|
| River | Dolores River | | | | |
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.028 | 0.035 | 0.032 | Gravel | 3/8 - 2-in gravel base |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.000 | 0.004 | 0.000 | Negligible | no obstructions |
| Vegetation, n4 | 0.001 | 0.010 | 0.005 | Small | no to very little vegetation |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.040 | 0.069 | 0.055 | | |
| | | | 0.060 | Selected "n" | |

ATLANTIC RICHFIELD - RICO
Manning's "n" Roughness Development
8-Nov-11

## HEC-RAS Manning's Roughness Coefficients

Roughness Designation: 9a shallow water - settling ponds - bare dirt bottom

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.025 | Firm Soil | Firm soil base, smooth |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.000 | 0.004 | 0.000 | Negligible | no obstructions |
| Vegetation, n4 | 0.001 | 0.010 | 0.001 | Small | no vegetation |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.037 | 0.066 | 0.044 | | |
| | | | 0.040 | Selected "n" | |

Roughness Designation: 9b paved road

| River | Dolores River | | | | |
|---|---|---|---|---|---|
| HEC-RAS Location | Refer to GIS map for locations along the reach | | | | |
| | Range | | | Condition | Observations |
| Base, nb | 0.025 | 0.032 | 0.025 | Firm Soil | Firm soil base, smooth |
| Irregularity, n1 | 0.001 | 0.005 | 0.003 | Minor | generally good condition |
| Variation, n2 | 0.010 | 0.015 | 0.015 | Alternating frequently | significant change in overbank geometry between cross sections |
| Obstruction, n3 | 0.000 | 0.004 | 0.000 | Negligible | no obstructions |
| Vegetation, n4 | 0.001 | 0.010 | 0.002 | Small | paved road, no vegetation |
| Meandering, m | 1.000 | 1.000 | 1.000 | Minor | very little meandering |
| Computed "n" | 0.037 | 0.066 | 0.045 | | |
| | | | 0.040 | Selected "n" | |

# Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains

## United States Geological Survey Water-supply Paper 2339

*Metric Version*

**Welcome to Manning's Roughness Coefficients for Natural Channels and Flood Plains**

☑ Table of Contents

☑ U.S. - SI Conversions

Authors: G.J. Arcement, Jr. and V.R. Schneider, USGS

NOTE: WSP2339 is the USGS version of FHWA-TS-84-204 which has the same title. The publications are substantially the same, but have different arrangement of figures.

DISCLAIMER: During the editing of this manual for conversion to an electronic format, the intent has been to convert the publication to the metric system while keeping the document as close to the original as possible. The document has undergone editorial update during the conversion process.

In developing the ability to assign *n* values, reliance must be placed on *n* values that have been verified. A verified *n* value is one that has been computed from known cross-sectional geometry and discharge values.

## Channel *n* Values

The most important factors that affect the selection of channel *n* values are:

1. the type and size of the materials that compose the bed and banks of the channel
2. the shape of the channel.

Cowan (1956) developed a procedure for estimating the effects of these factors to determine the value of *n* for a channel. The value of *n* may be computed by

$$n=(n_b+n_1+n_2+n_3+n_4)m \quad (3)$$

where :

$n_b$ =a base value of *n* for a straight, uniform, smooth channel in natural materials
$n_1$ =a correction factor for the effect of surface irregularities
$n_2$ = a value for variations in shape and size of the channel cross section,
$n_3$ =a value for obstructions
$n_4$ =a value for vegetation and flow conditions
m=a correction factor for meandering of the channel

## Base *n* Values ($n_b$) for Channels

In the selection of a base *n* value for channel subsections, the channel must be classified as a stable channel or as a sand channel.

A stable channel is defined as a channel in which the bed is composed of firm soil, gravel, cobbles, boulders, or bedrock and the channel remains relatively unchanged throughout most of the range in flow. modified from Aldridge and Garrett, 1973) lists base $n_b$ values for stable channels and sand channels. The bases values of Benson and Dalrymple (1967) apply to conditions that are close to average, whereas Chow's (1959) base values are for the smoothest reach attainable for a given bed material.

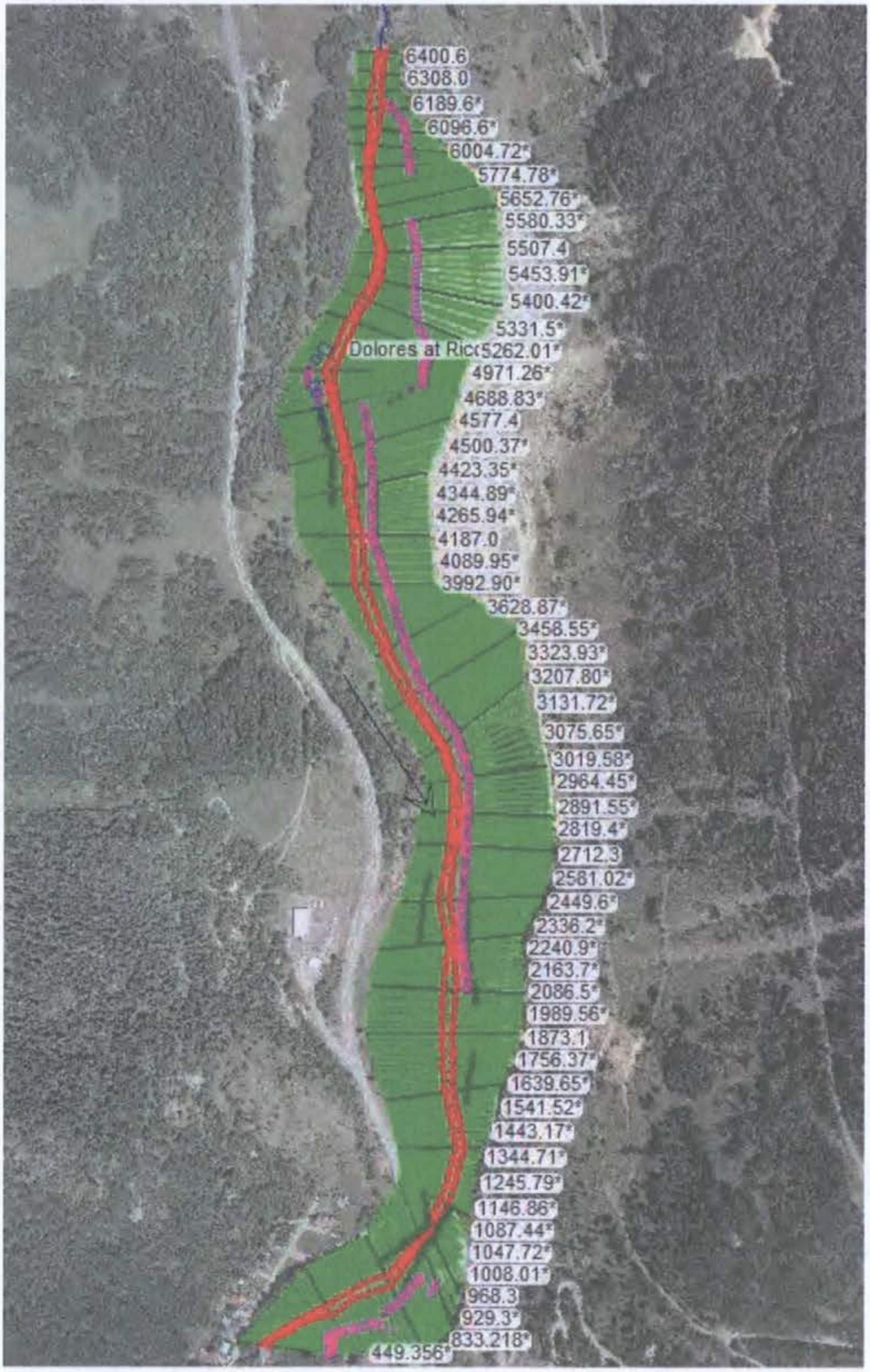
Barnes (1967) cataloged verified *n* values for stable channels having roughness coefficients ranging from 0.024 to 0.075. In addition to a description of the cross section, bed material, and flow conditions during the measurement, color photographs of the channels were provided.

A sand channel is defined as a channel in which the bed has an unlimited supply of sand. By definition, sand ranges in grain size from 0.062 to 2mm. Resistance to flow varies greatly in sand channels because the bed material moves easily and takes on different configurations or bed forms. Bed form is a function of velocity of flow, grain size, bed shear, and temperature.

# APPENDIX B5

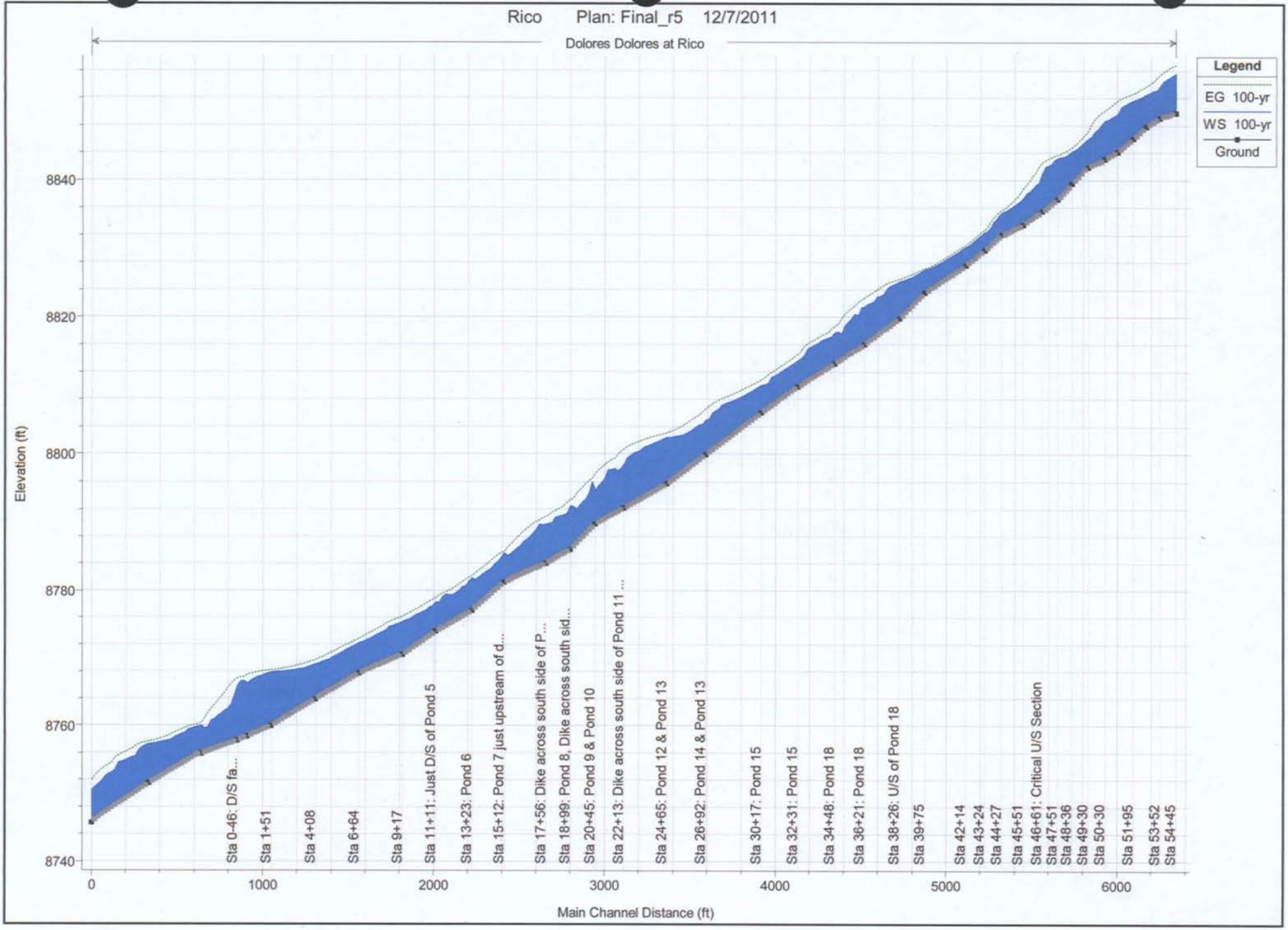
# HEC RAS OUTPUT TABLES / CROSS SECTIONS

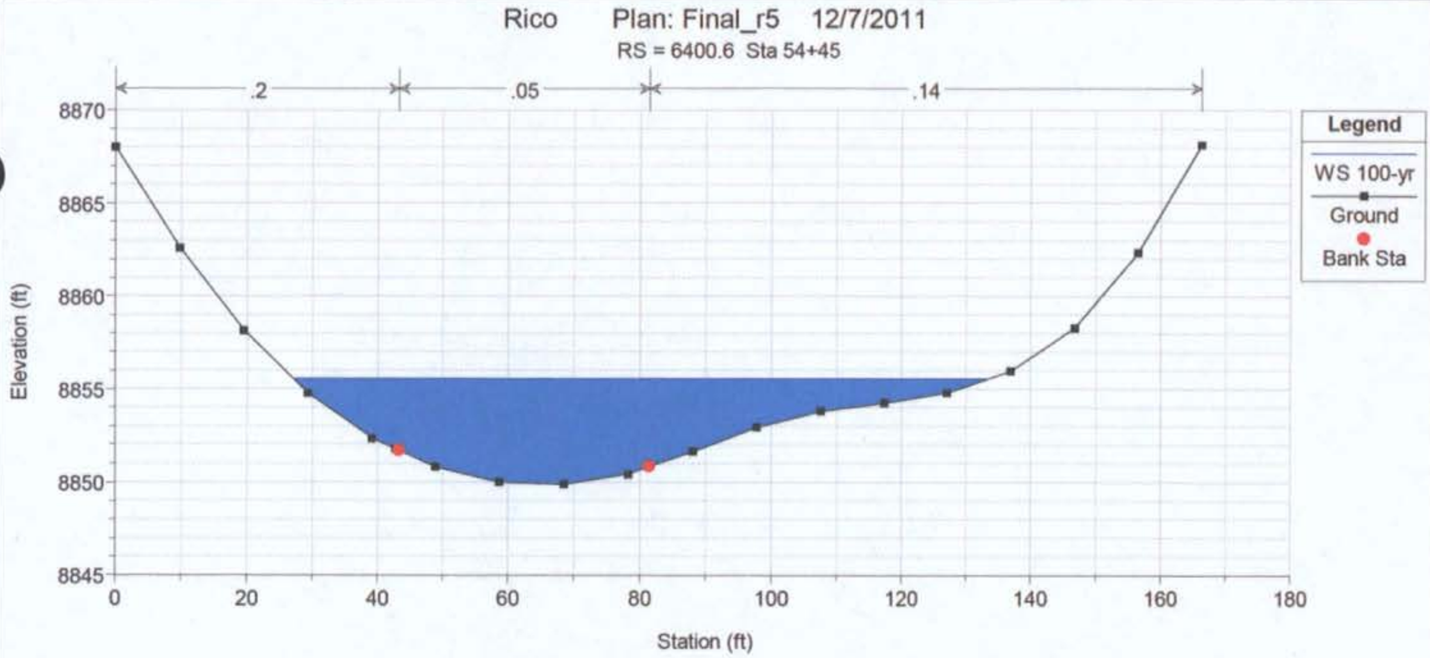
## Plan View of HEC-RAS Geometry File



Plan Final_r5 Profile 100-year
Flow 2200 cfs

| River Sta | RAS River Sta | Slope Invert | Min Ch El (ft) | W.S. El (ft) | Max Chl Dpth (ft) | Crit W.S. (ft) | E.G. Elev (ft) | Vel Chnl (ft/s) | Vel Total (ft/s) | Top Width (ft) | Mann Wtd Left | Mann Wtd Chnl | Mann Wtd Rght | Froude # Chnl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54+44.5 | 6400.6 | 0.0081 | 8849.9 | 8855.6 | 5.7 | 8855.0 | 8856.9 | 9.85 | 6.43 | 106.4 | 0.200 | 0.050 | 0.140 | 0.76 |
| 53+51.9 | 6308.0 | 0.0171 | 8849.1 | 8853.7 | 4.6 | 8853.7 | 8855.4 | 12.00 | 6.46 | 110.6 | 0.200 | 0.051 | 0.139 | 1.00 |
| 52+72.5 | 6228.6 | 0.0215 | 8847.8 | 8852.6 | 4.8 | 8852.0 | 8853.7 | 9.33 | 5.33 | 130.4 | 0.200 | 0.050 | 0.200 | 0.78 |
| 51+94.5 | 6150.6 | 0.0216 | 8846.1 | 8851.6 | 5.6 | 8850.7 | 8852.7 | 8.76 | 5.37 | 123.5 | 0.200 | 0.050 | 0.200 | 0.69 |
| 51+04.5 | 6060.6 | 0.0140 | 8844.1 | 8849.7 | 5.5 | 8849.6 | 8851.6 | 11.82 | 7.20 | 98.3 | 0.200 | 0.050 | 0.200 | 0.92 |
| 50+30.0 | 5986.1 | 0.0151 | 8843.1 | 8848.7 | 5.6 | 8848.4 | 8850.2 | 10.69 | 5.83 | 128.4 | 0.200 | 0.050 | 0.200 | 0.83 |
| 49+30.7 | 5886.8 | 0.0216 | 8841.9 | 8846.1 | 5.1 | 8845.9 | 8847.2 | 12.40 | 4.07 | 184.3 | 0.200 | 0.050 | 0.080 | 1.09 |
| 48+35.7 | 5791.8 | 0.0300 | 8839.5 | 8844.2 | 5.2 |  | 8844.8 | 9.59 | 2.90 | 239.1 | 0.200 | 0.050 | 0.080 | 0.81 |
| 47+50.6 | 5706.7 | 0.0211 | 8837.3 | 8843.2 | 6.5 |  | 8843.7 | 7.85 | 2.78 | 190.1 | 0.199 | 0.050 | 0.080 | 0.59 |
| 46+60.7 | 5616.8 | 0.0198 | 8835.5 | 8840.9 | 5.5 | 8840.9 | 8842.6 | 12.90 | 4.82 | 136.5 | 0.196 | 0.050 | 0.160 | 1.00 |
| 45+51.3 | 5507.4 | 0.0124 | 8833.5 | 8837.4 | 5.4 | 8837.4 | 8838.9 | 12.40 | 4.98 | 162.5 | 0.196 | 0.050 | 0.200 | 1.13 |
| 44+26.5 | 5382.6 | 0.0223 | 8832.1 | 8835.3 | 8.0 | 8832.6 | 8835.7 | 7.22 | 3.22 | 182.7 | 0.193 | 0.050 | 0.200 | 0.72 |
| 43+24.3 | 5280.4 | 0.0201 | 8829.8 | 8832.4 | 7.1 | 8830.6 | 8832.8 | 6.91 | 4.27 | 162.3 | 0.147 | 0.050 | 0.200 | 0.79 |
| 42+14.0 | 5170.1 | 0.0166 | 8827.5 | 8830.2 | 6.4 | 8828.4 | 8830.5 | 6.99 | 3.70 | 226.5 | 0.147 | 0.050 | 0.180 | 0.77 |
| 39+75.4 | 4931.5 | 0.0257 | 8823.6 | 8826.9 | 5.9 | 8824.4 | 8827.1 | 5.63 | 2.69 | 291.2 | 0.155 | 0.050 | 0.180 | 0.58 |
| 38+25.6 | 4781.7 | 0.0188 | 8819.8 | 8825.2 | 5.4 | 8823.8 | 8825.6 | 7.39 | 2.44 | 380.6 | 0.174 | 0.050 | 0.180 | 0.57 |
| 36+21.3 | 4577.4 | 0.0161 | 8816.0 | 8821.5 | 5.5 | 8820.9 | 8822.9 | 10.56 | 4.78 | 273.6 | 0.196 | 0.051 | 0.180 | 0.81 |
| 34+48.0 | 4404.1 | 0.0137 | 8813.2 | 8817.8 | 4.6 | 8817.3 | 8818.6 | 8.90 | 4.04 | 250.7 | 0.200 | 0.050 | 0.132 | 0.74 |
| 32+30.9 | 4187.0 | 0.0175 | 8809.8 | 8813.7 | 3.9 | 8813.3 | 8814.6 | 9.61 | 5.35 | 158.2 | 0.179 | 0.050 | 0.121 | 0.90 |
| 30+17.4 | 3973.5 | 0.0188 | 8806.0 | 8810.0 | 4.0 | 8809.3 | 8810.8 | 8.04 | 4.27 | 170.0 | 0.193 | 0.050 | 0.199 | 0.72 |
| 26+91.7 | 3647.8 | 0.0185 | 8799.9 | 8804.9 | 5.0 | 8804.6 | 8806.5 | 10.74 | 7.23 | 86.9 | 0.200 | 0.050 | 0.200 | 0.87 |
| 24+64.6 | 3420.7 | 0.0139 | 8795.7 | 8802.4 | 6.7 | 8800.5 | 8803.1 | 7.56 | 3.85 | 124.8 | 0.158 | 0.051 | 0.200 | 0.53 |
| 22+13.0 | 3169.1 | 0.0140 | 8792.2 | 8798.5 | 6.3 | 8798.5 | 8800.8 | 12.71 | 8.64 | 64.4 | 0.152 | 0.050 | 0.200 | 0.95 |
| 20+44.8 | 3000.9 | 0.0264 | 8789.9 | 8794.7 | 4.9 | 8795.3 | 8797.2 | 13.66 | 7.99 | 97.8 | 0.164 | 0.050 | 0.200 | 1.13 |
| 18+99.0 | 2855.1 | 0.0134 | 8786.1 | 8792.5 | 6.4 | 8791.4 | 8793.4 | 8.59 | 4.56 | 130.3 | 0.110 | 0.050 | 0.200 | 0.64 |
| 17+56.2 | 2712.3 | 0.0102 | 8784.0 | 8789.8 | 5.8 | 8789.3 | 8791.0 | 9.61 | 4.67 | 166.7 | 0.110 | 0.050 | 0.200 | 0.73 |
| 15+12.4 | 2468.5 | 0.0222 | 8781.2 | 8785.5 | 4.3 | 8785.1 | 8785.8 | 5.63 | 3.28 | 389.3 | 0.058 | 0.052 | 0.128 | 0.49 |
| 13+23.4 | 2279.5 | 0.0165 | 8777.1 | 8781.8 | 4.8 | 8781.5 | 8782.2 | 7.02 | 3.81 | 334.6 | 0.049 | 0.050 | 0.150 | 0.58 |
| 11+11.1 | 2067.2 | 0.0237 | 8774.0 | 8778.2 | 4.2 | 8777.7 | 8778.9 | 7.68 | 3.49 | 337.2 | 0.200 | 0.050 | 0.114 | 0.68 |
| 9+17.0 | 1873.1 | 0.0108 | 8770.5 | 8775.3 | 4.8 | 8775.1 | 8776.2 | 8.54 | 3.34 | 363.1 | 0.200 | 0.050 | 0.199 | 0.71 |
| 6+64.1 | 1620.2 | 0.0147 | 8767.7 | 8772.2 | 4.5 |  | 8772.9 | 8.41 | 2.64 | 398.1 | 0.200 | 0.051 | 0.191 | 0.71 |
| 4+08.4 | 1364.5 | 0.0152 | 8763.9 | 8769.0 | 5.1 |  | 8769.7 | 8.25 | 3.18 | 238.8 | 0.106 | 0.050 | 0.200 | 0.66 |
| 1+51.2 | 1107.3 | 0.0111 | 8760.0 | 8767.9 | 7.9 |  | 8768.2 | 5.41 | 2.60 | 184.7 | 0.110 | 0.050 | 0.200 | 0.35 |
| 0+12.2 | 968.3 | 0.0103 | 8758.4 | 8766.2 | 7.8 |  | 8767.5 | 9.81 | 6.87 | 83.0 | 0.110 | 0.050 | 0.200 | 0.64 |
| -0+46.3 | 909.8 | 0.0089 | 8757.8 | 8765.9 | 8.1 | 8764.6 | 8767.0 | 9.42 | 6.72 | 87.4 | 0.097 | 0.050 | 0.066 | 0.61 |
| -2+56.9 | 699.2 | 0.0062 | 8755.9 | 8760.0 | 4.1 | 8759.3 | 8760.4 | 6.50 | 2.53 | 417.0 | 0.180 | 0.050 | 0.130 | 0.57 |
| -5+64.4 | 391.7 | 0.0167 | 8751.5 | 8757.3 | 5.7 | 8755.4 | 8757.7 | 6.00 | 2.77 | 200.7 | 0.180 | 0.050 | 0.175 | 0.45 |
| -9+14.9 | 41.2 |  | 8745.7 | 8750.5 | 4.7 | 8750.2 | 8752.0 | 10.63 | 5.88 | 138.4 | 0.180 | 0.050 | 0.200 | 0.88 |


Rico Plan: Final_r5 12/7/2011
Dolores Dolores at Rico
Legend
EG 100-yr
WS 100-yr
Ground
Elevation (ft)
8840
8820
8800
8780
8760
8740
Main Channel Distance (ft)
0
1000
2000
3000
4000
5000
6000
Sta 0-46: D/S fa...
Sta 1+51
Sta 4+08
Sta 6+64
Sta 9+17
Sta 11+11: Just D/S of Pond 5
Sta 13+23: Pond 6
Sta 15+12: Pond 7 just upstream of d...
Sta 17+56: Dike across south side of P...
Sta 18+99: Pond 8, Dike across south sid...
Sta 20+45: Pond 9 & Pond 10
Sta 22+13: Dike across south side of Pond 11 ...
Sta 24+65: Pond 12 & Pond 13
Sta 26+92: Pond 14 & Pond 13
Sta 30+17: Pond 15
Sta 32+31: Pond 15
Sta 34+48: Pond 18
Sta 36+21: Pond 18
Sta 38+26: U/S of Pond 18
Sta 39+75
Sta 42+14
Sta 43+24
Sta 44+27
Sta 45+51
Sta 46+61: Critical U/S Section
Sta 47+51
Sta 48+36
Sta 49+30
Sta 50+30
Sta 51+95
Sta 53+52
Sta 54+45



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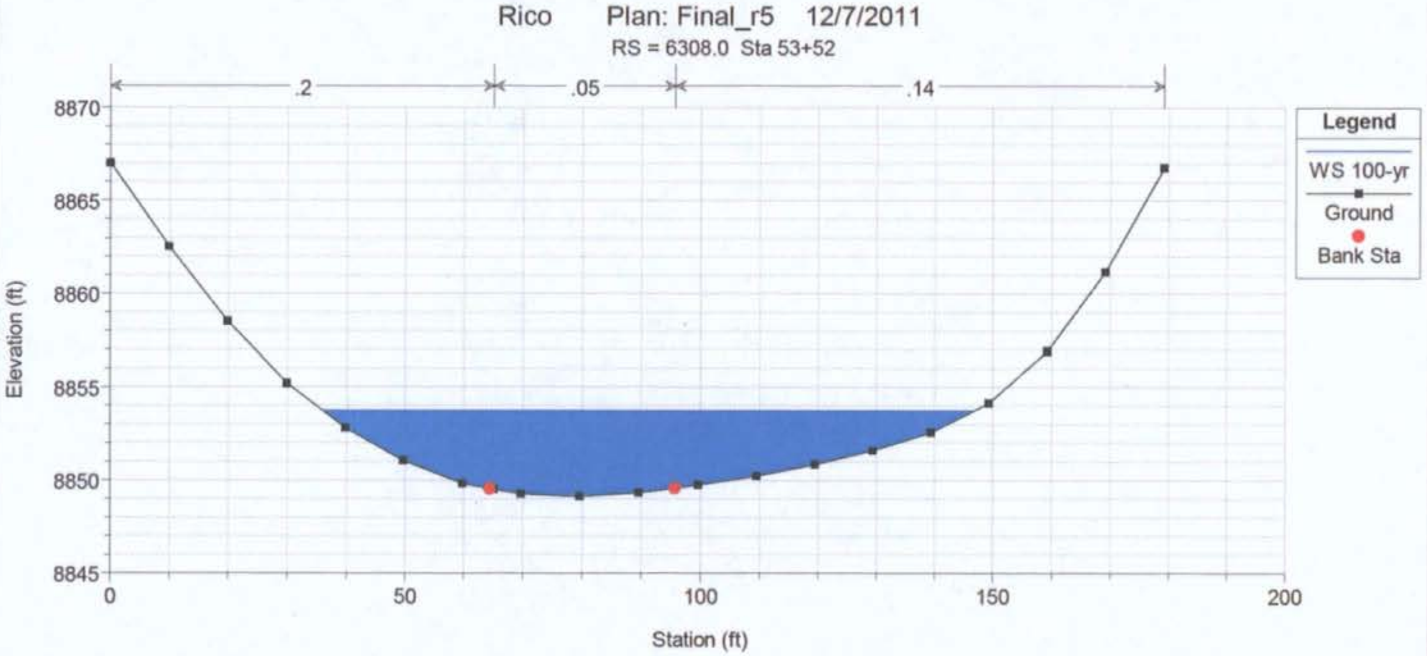
RS = 6400.6 Sta 54+45



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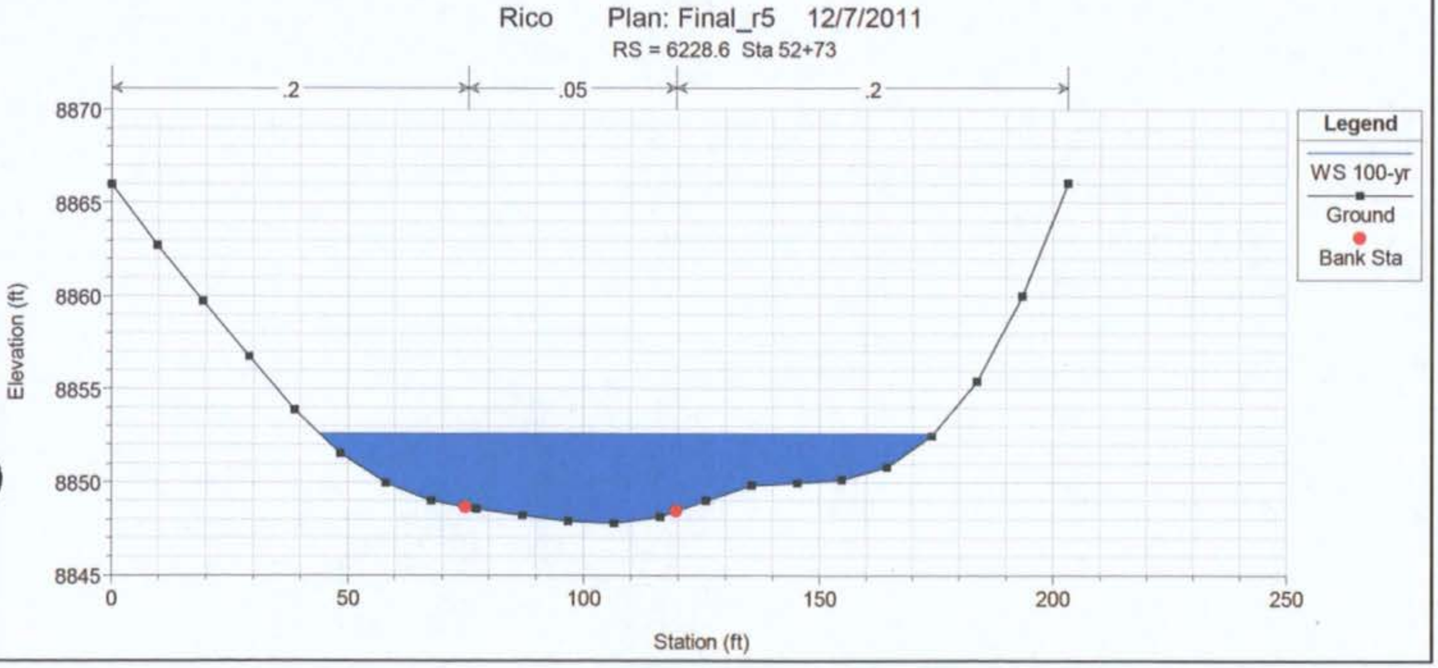

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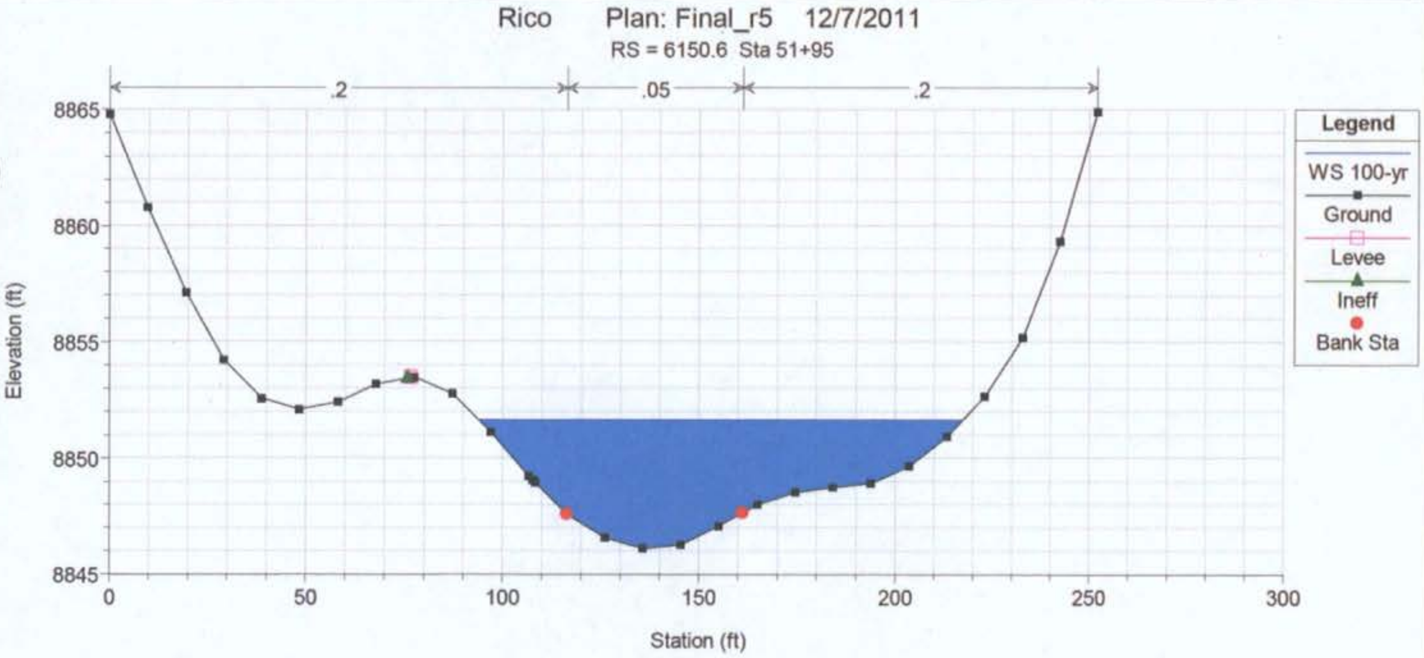
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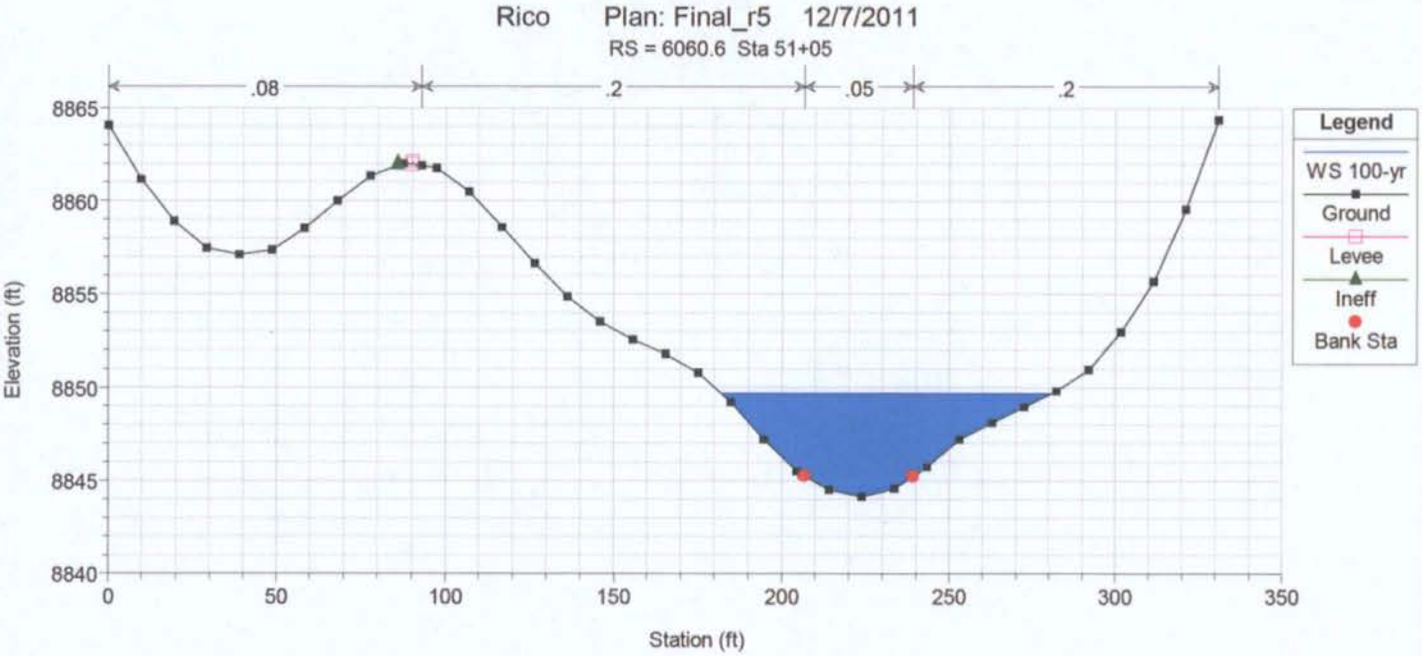
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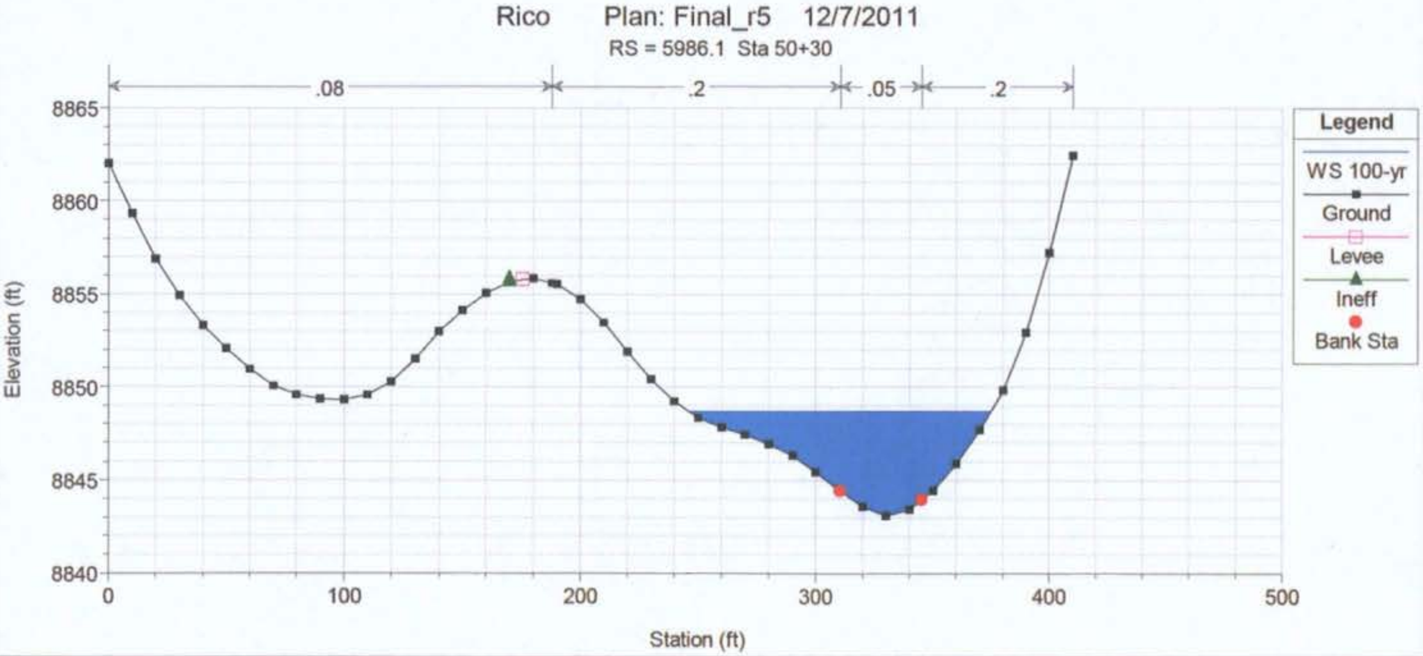
RS = 6060.6 Sta 51+05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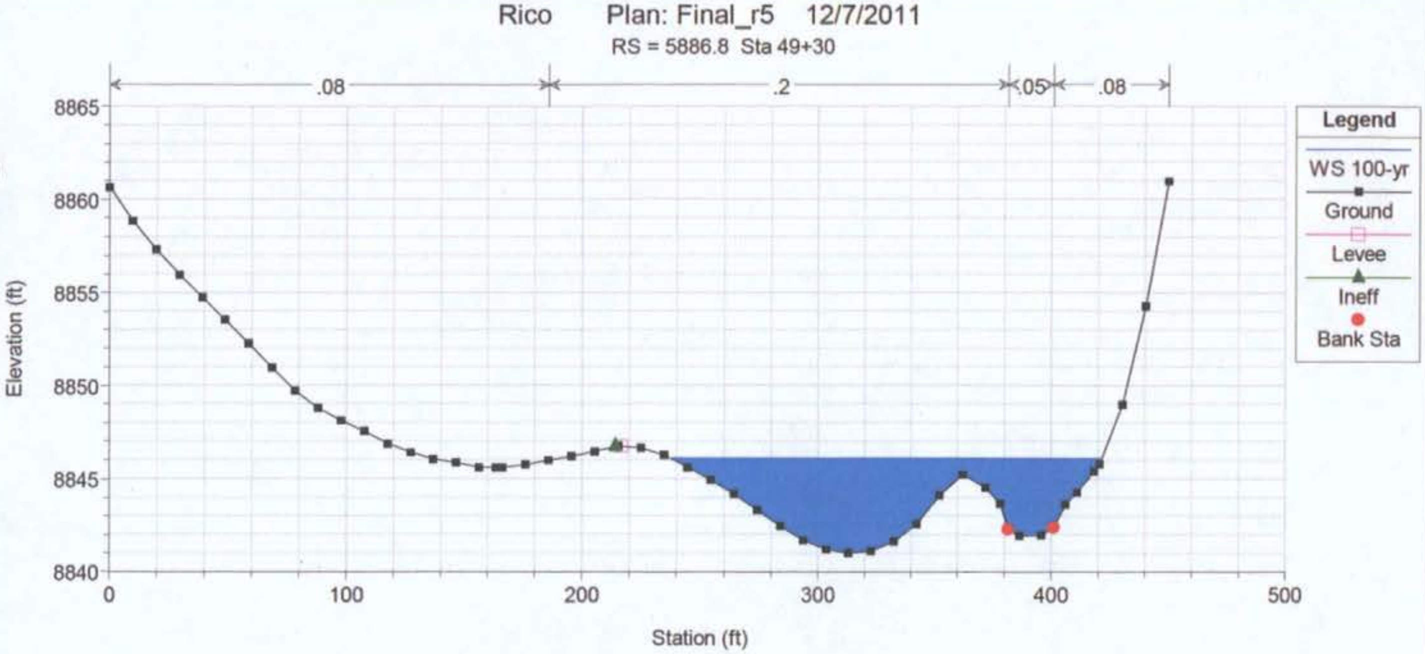
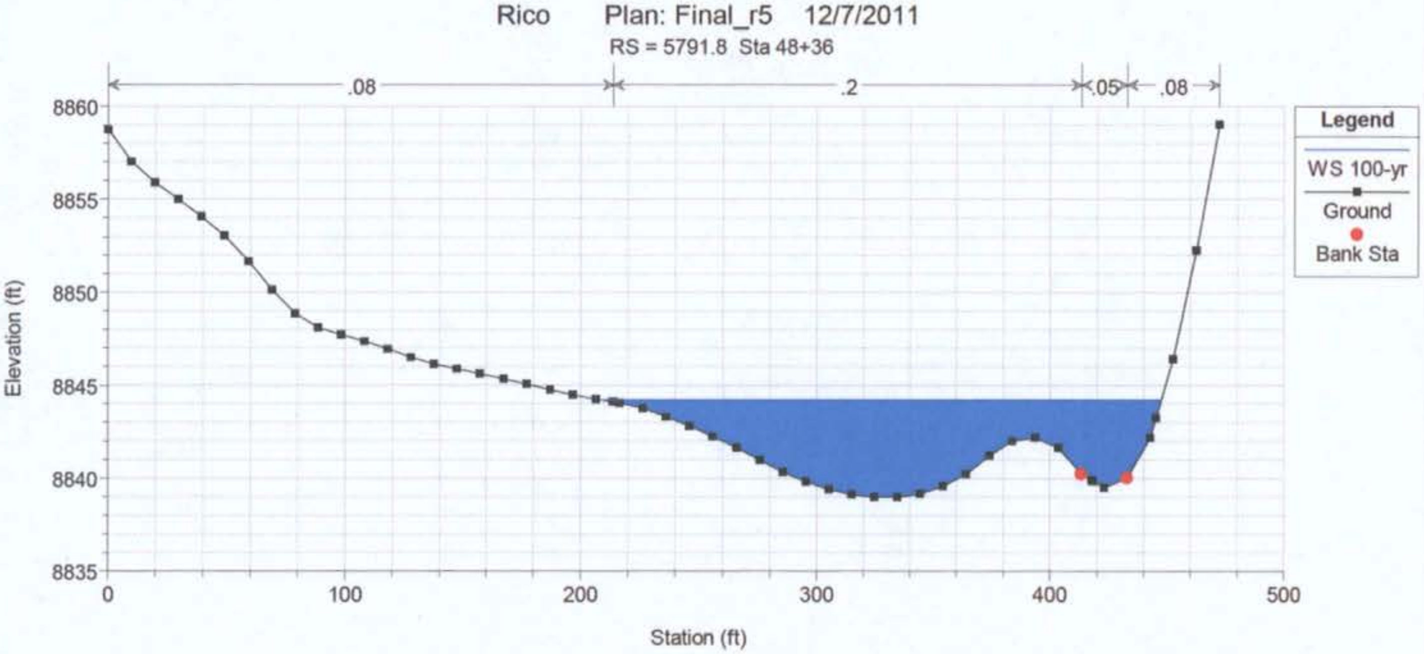
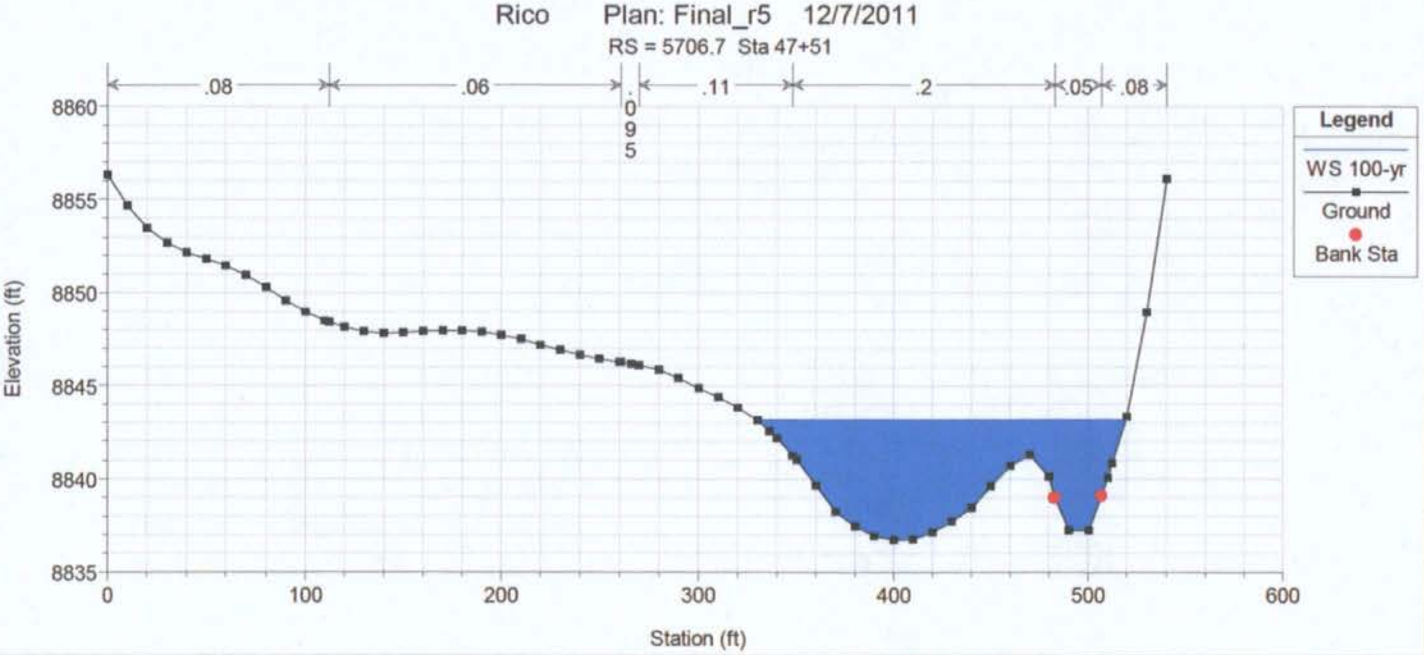
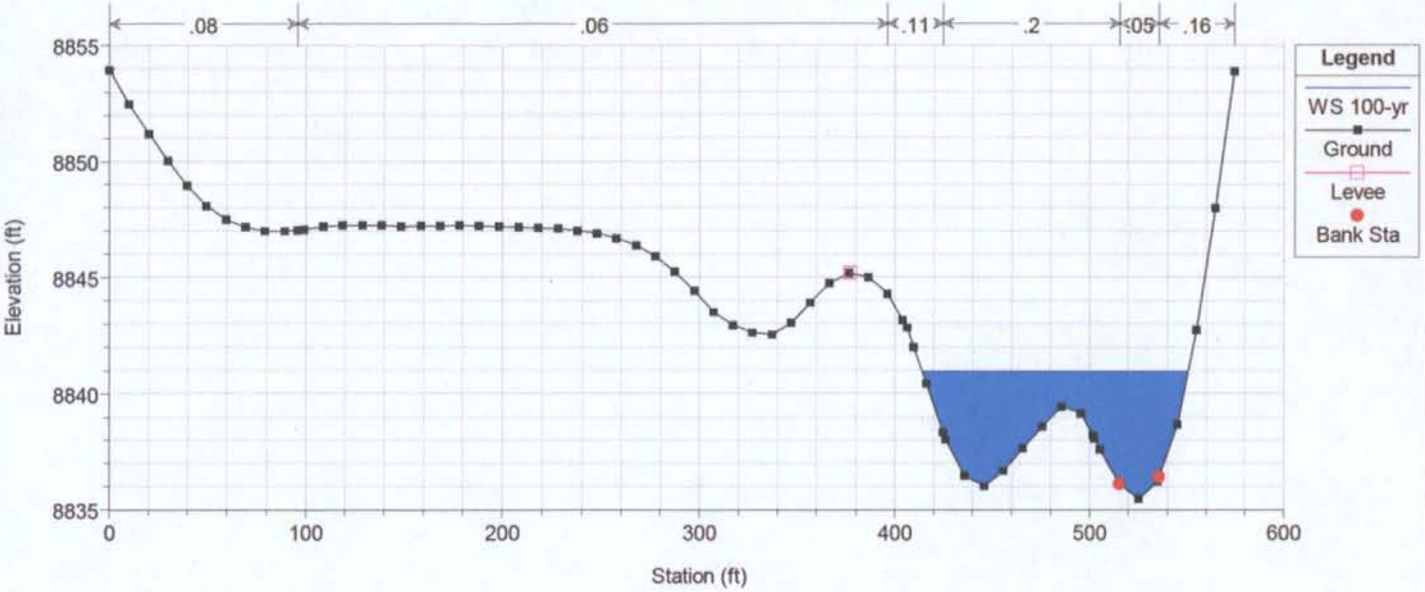

Rico Plan: Final_r5 12/7/2011
RS = 5886.8 Sta 49+30
.08
.2
.05
.08
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
8865
8860
8855
8850
8845
8840
0
100
200
300
400
500
Station (ft)


Rico Plan: Final_r5 12/7/2011
RS = 5791.8 Sta 48+36
.08
.2
.05
.08
Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
8860
8855
8850
8845
8840
8835
0
100
200
300
400
500
Station (ft)


Rico Plan: Final_r5 12/7/2011
RS = 5706.7 Sta 47+51
.08
.06
.095
.11
.2
.05
.08
Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
8860
8855
8850
8845
8840
8835
0
100
200
300
400
500
600
Station (ft)

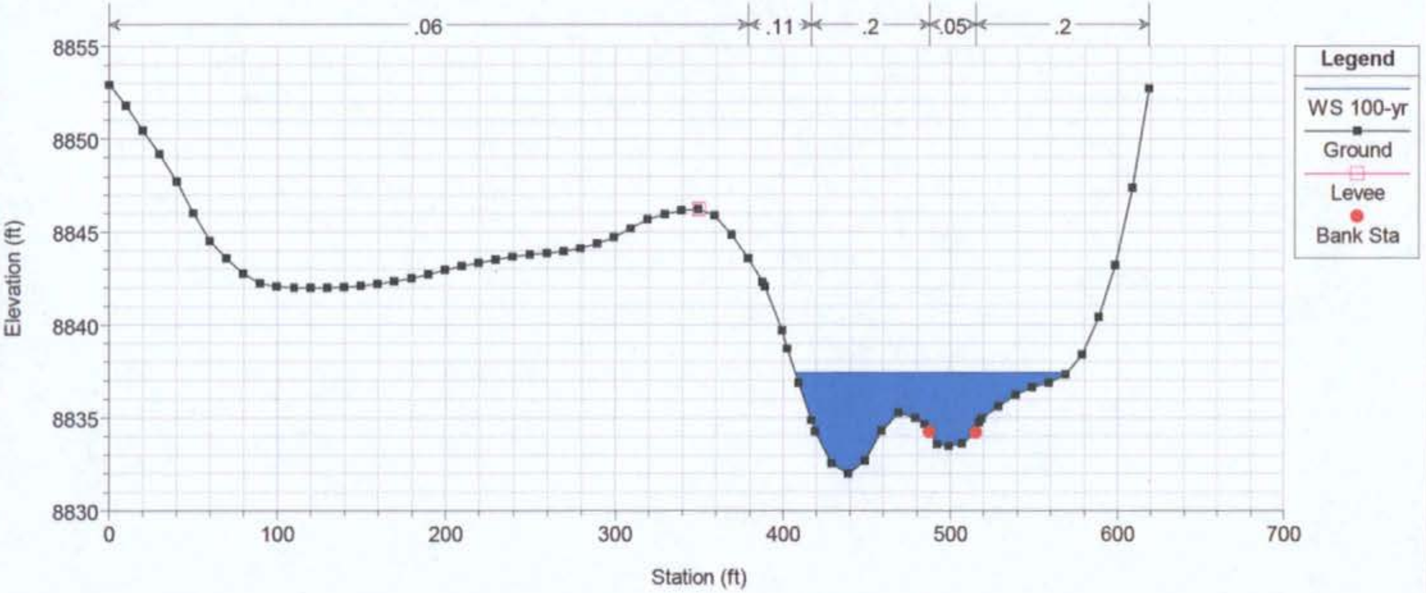
Rico Plan: Final_r5 12/7/2011

RS = 5616.8 Sta 46+61: Critical U/S Section



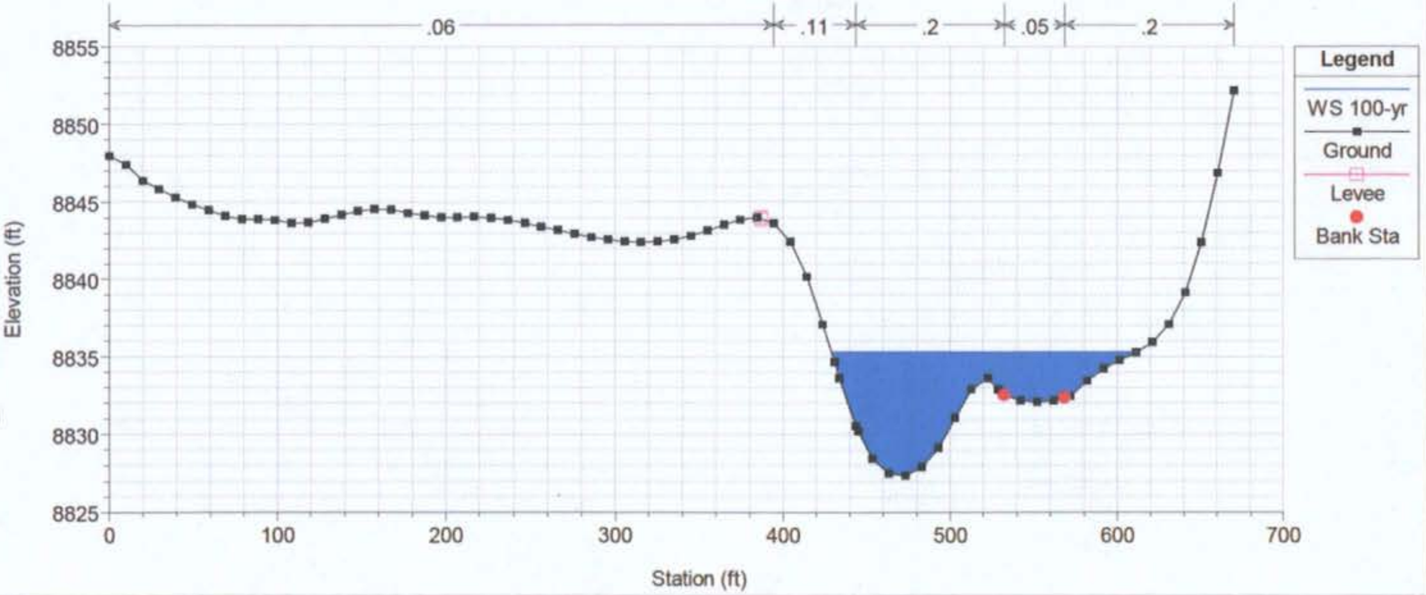
Rico Plan: Final_r5 12/7/2011

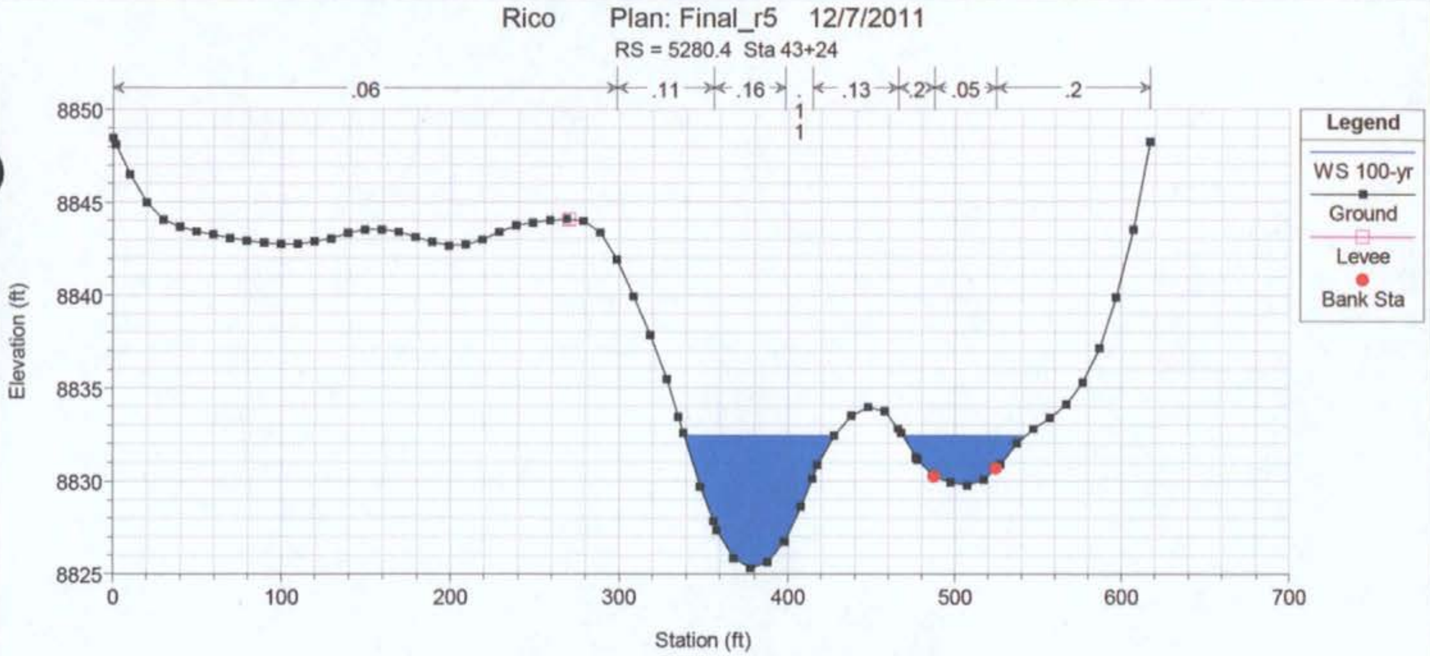
RS = 5507.4 Sta 45+51

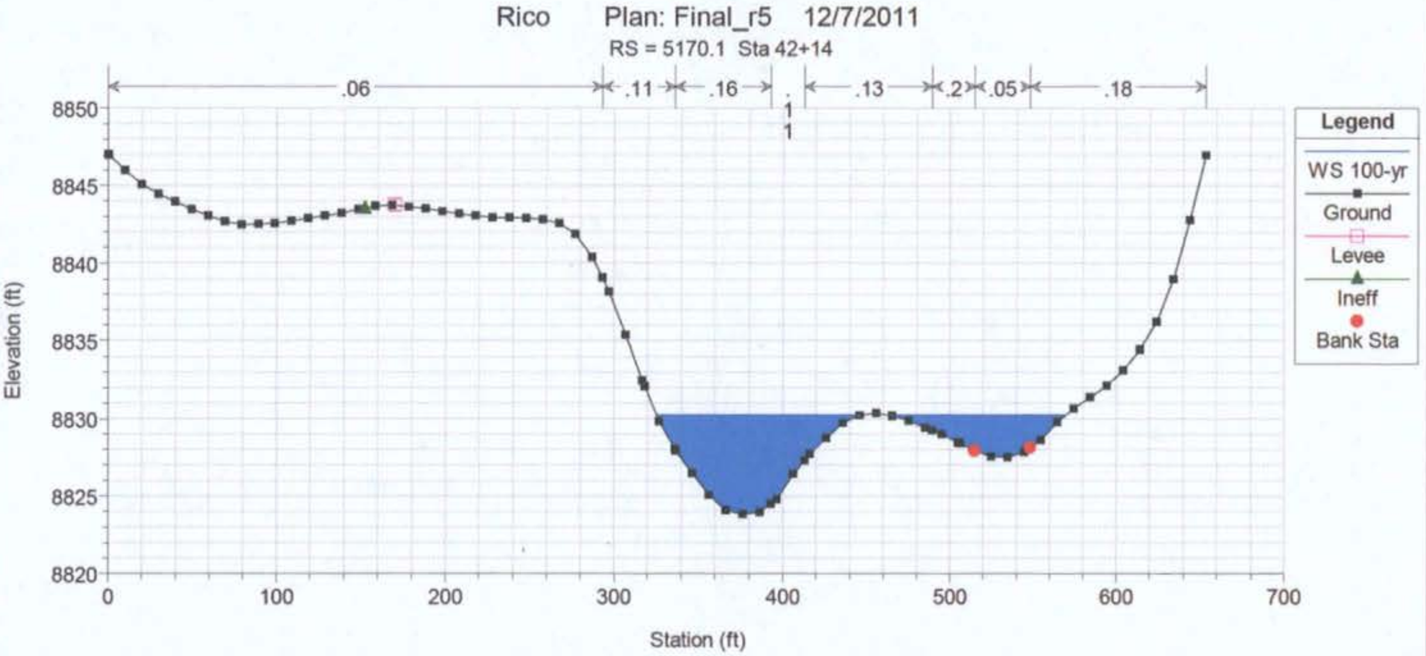


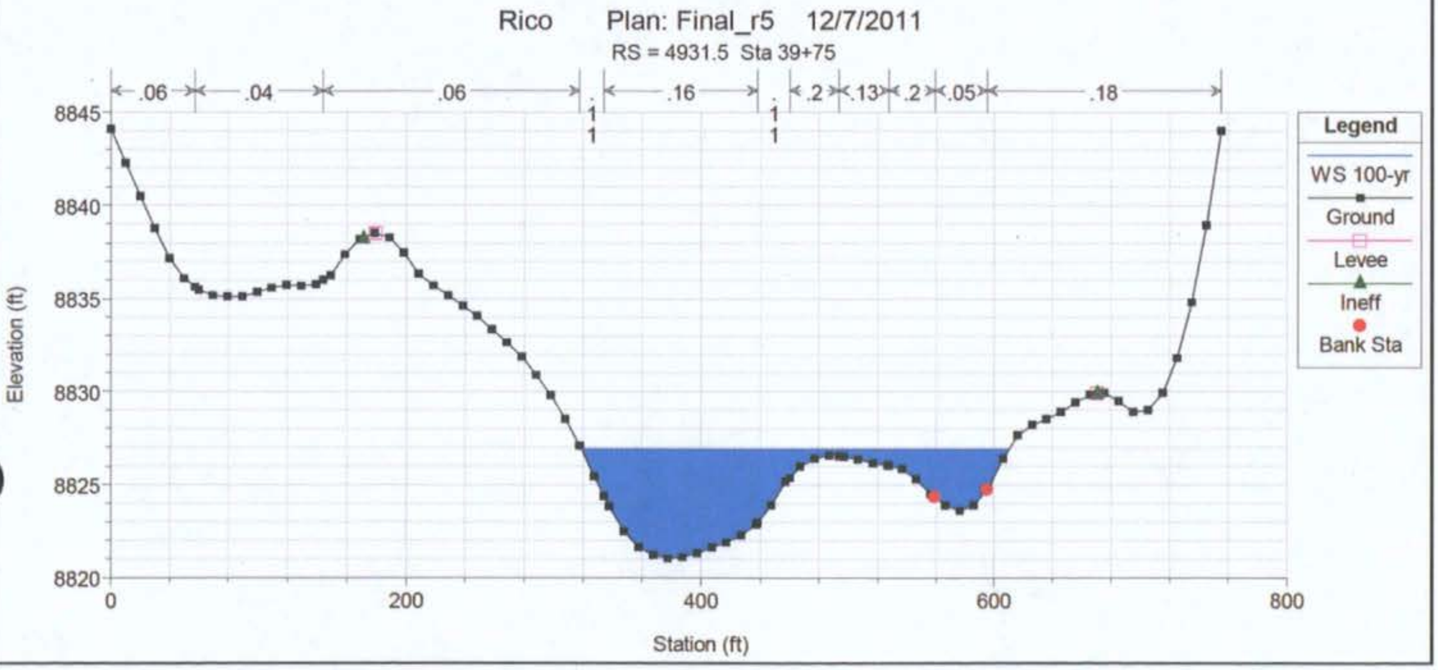
Rico Plan: Final_r5 12/7/2011

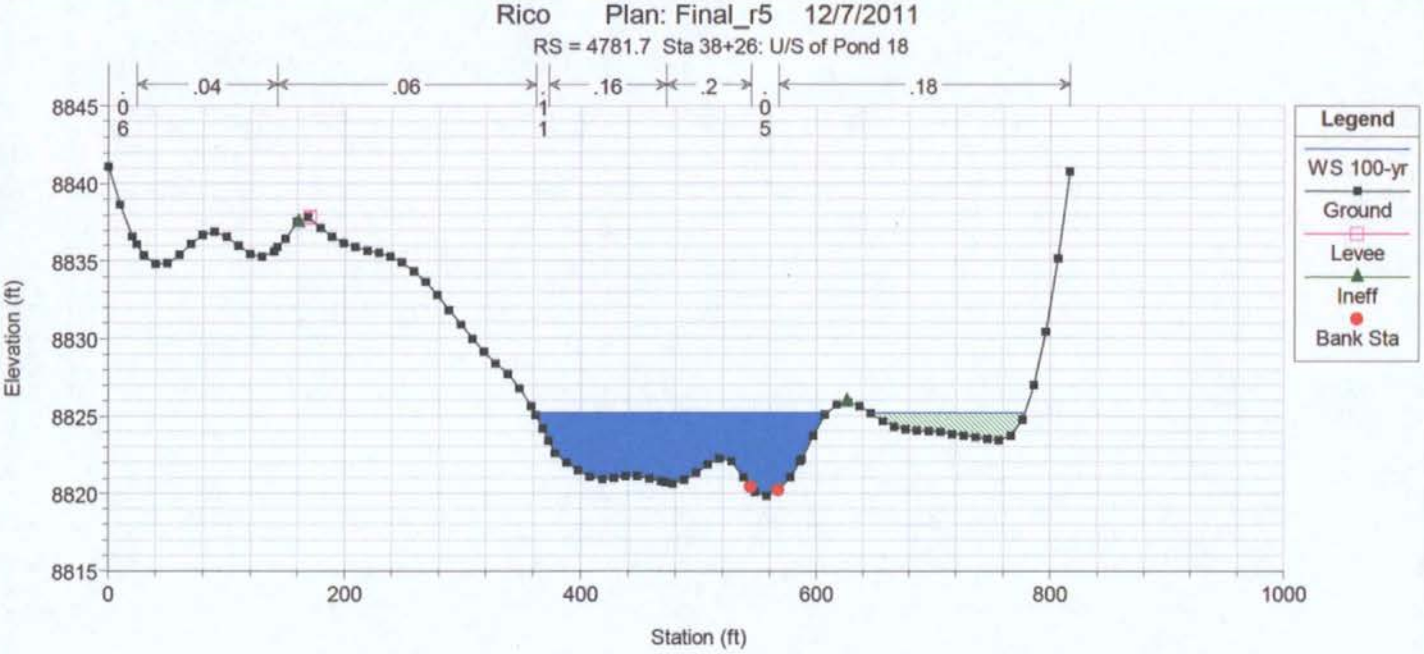
RS = 5382.6 Sta 44+27

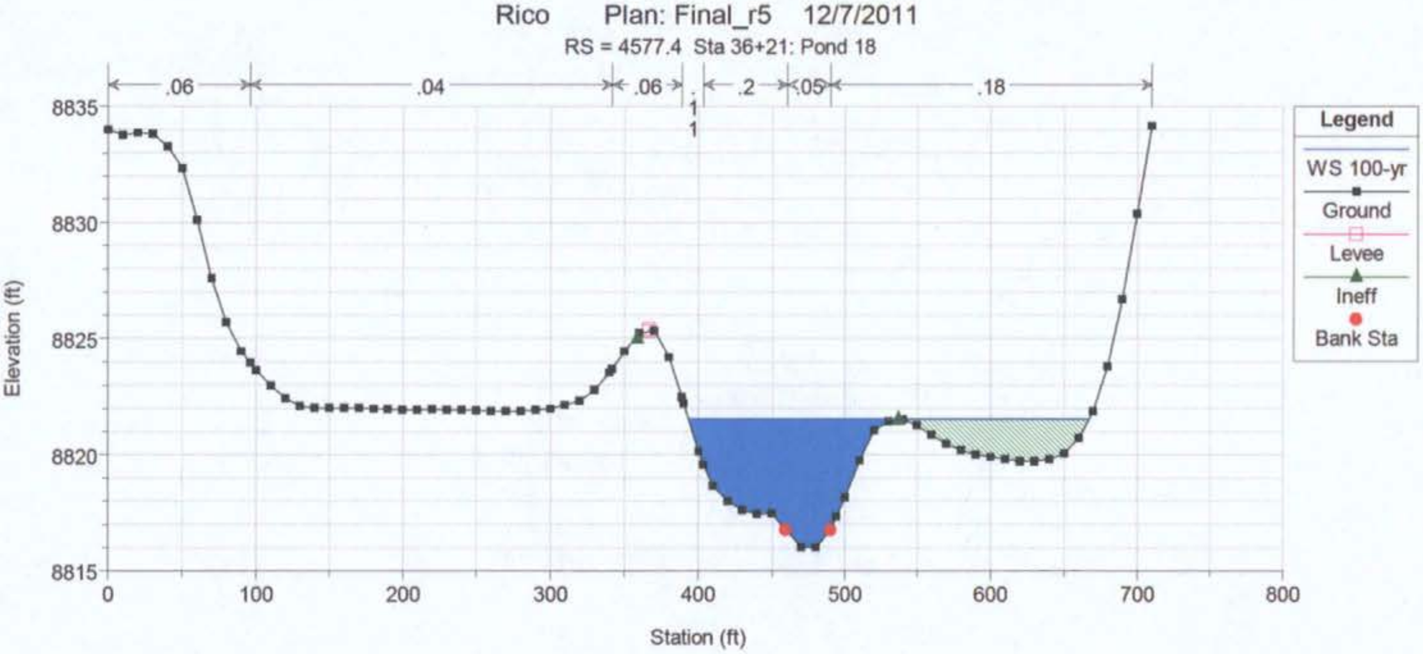


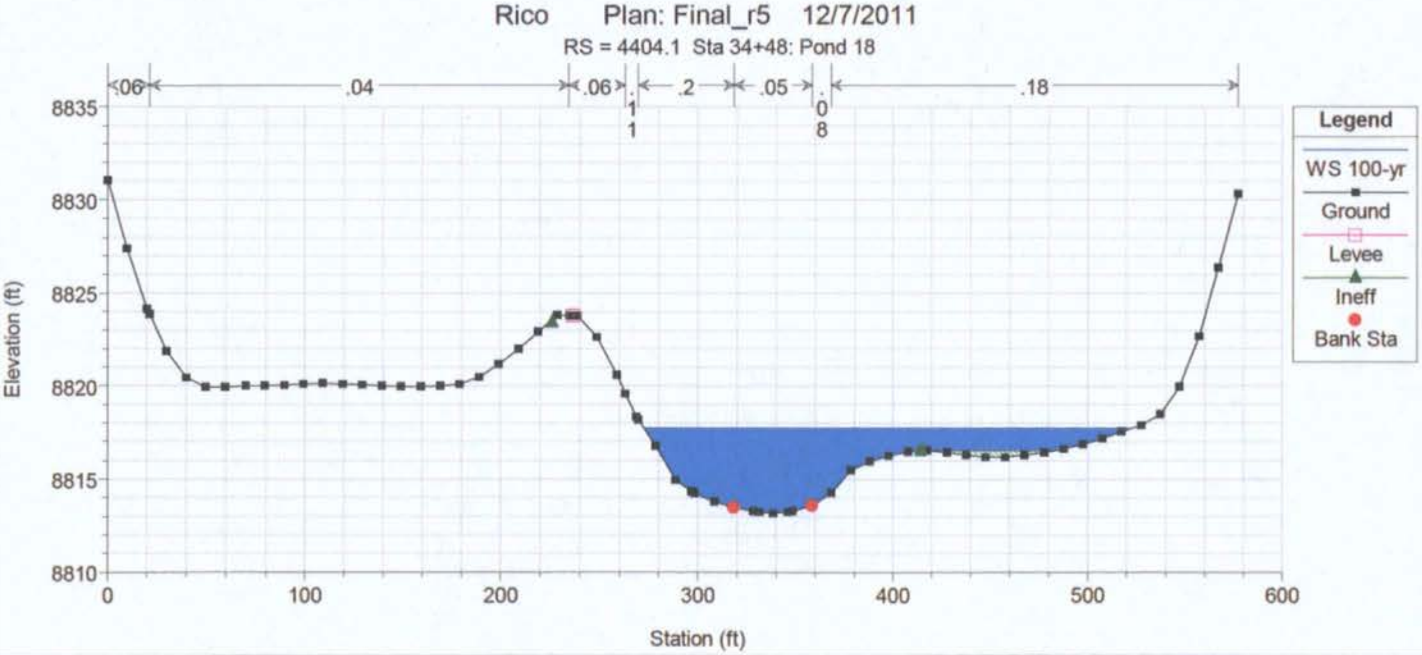

Rico Plan: Final_r5 12/7/2011
RS = 5280.4 Sta 43+24
.06
.11
.16
.
1
1
.13
.2
.05
.2
Elevation (ft)
8850
8845
8840
8835
8830
8825
Station (ft)
0
100
200
300
400
500
600
700
Legend
WS 100-yr
Ground
Levee
Bank Sta


Rico Plan: Final_r5 12/7/2011
RS = 5170.1 Sta 42+14
.06
.11
.16
.
1
1
.13
.2
.05
.18
Elevation (ft)
8850
8845
8840
8835
8830
8825
8820
Station (ft)
0
100
200
300
400
500
600
700
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta


Rico Plan: Final_r5 12/7/2011
RS = 4931.5 Sta 39+75
.06
.04
.06
.
1
1
.16
.
1
1
.2
.13
.2
.05
.18
Elevation (ft)
8845
8840
8835
8830
8825
8820
Station (ft)
0
200
400
600
800
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta

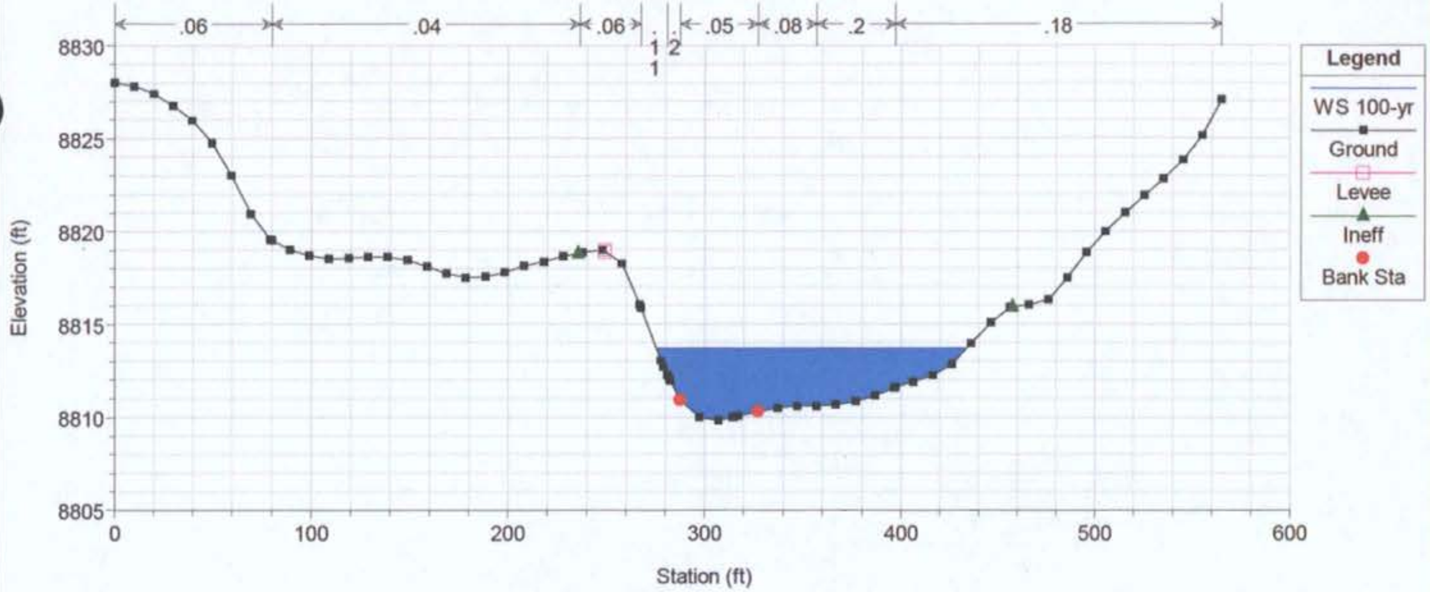

Rico Plan: Final_r5 12/7/2011
RS = 4781.7 Sta 38+26: U/S of Pond 18
.06
.04
.06
.11
.16
.2
.05
.18
Elevation (ft)
8845
8840
8835
8830
8825
8820
8815
0
200
400
600
800
1000
Station (ft)
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta


Rico Plan: Final_r5 12/7/2011
RS = 4577.4 Sta 36+21: Pond 18
.06
.04
.06
.11
.2
.05
.18
Elevation (ft)
8835
8830
8825
8820
8815
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta


Rico Plan: Final_r5 12/7/2011
RS = 4404.1 Sta 34+48: Pond 18
.06
.04
.06
.11
.2
.05
.08
.18
Elevation (ft)
8835
8830
8825
8820
8815
8810
0
100
200
300
400
500
600
Station (ft)
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta

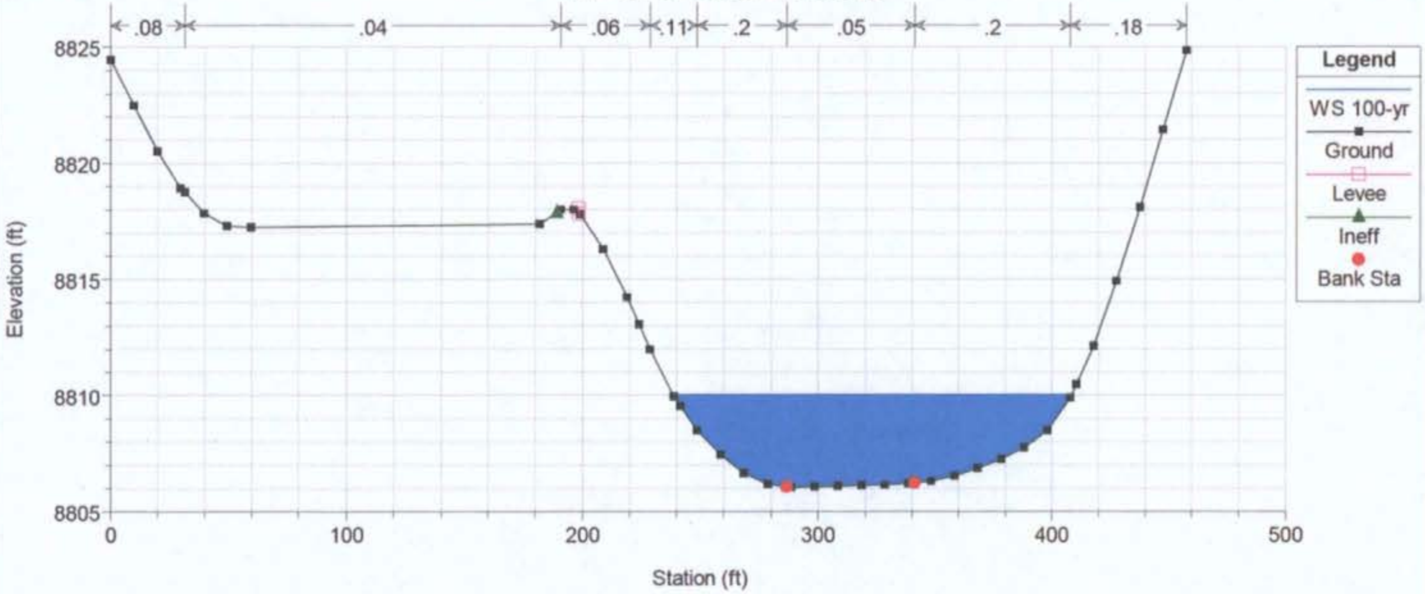
Rico Plan: Final_r5 12/7/2011

RS = 4187.0 Sta 32+31: Pond 15



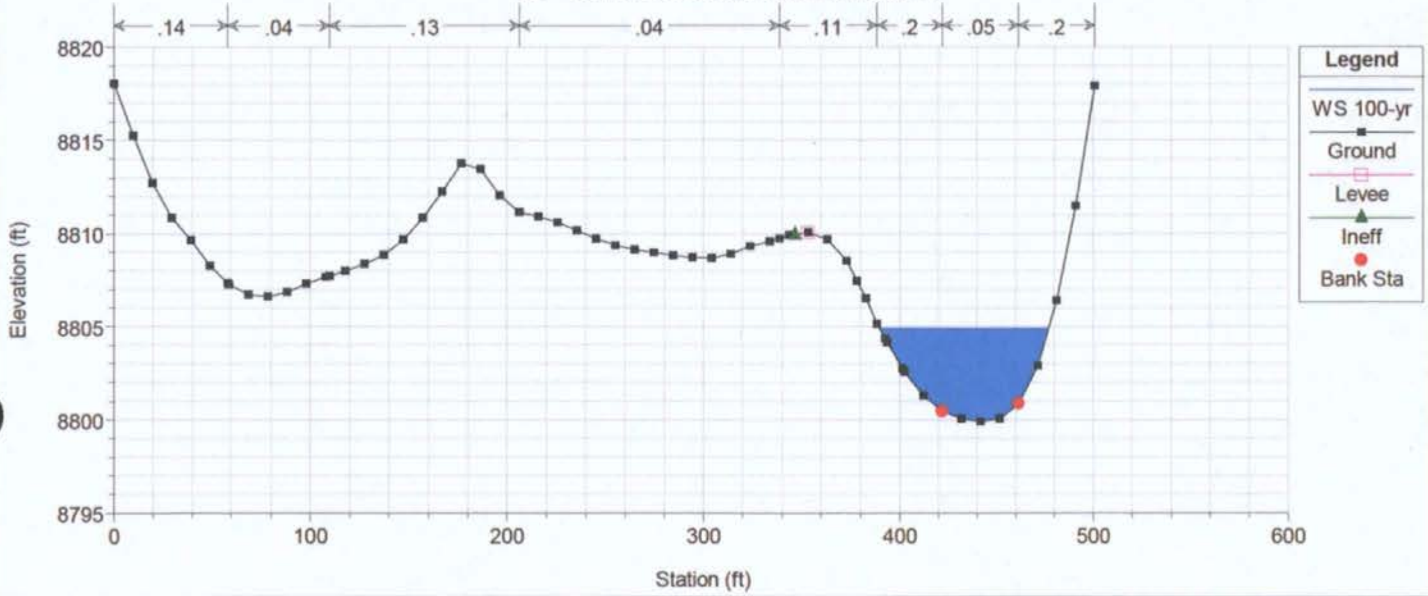
Rico Plan: Final_r5 12/7/2011

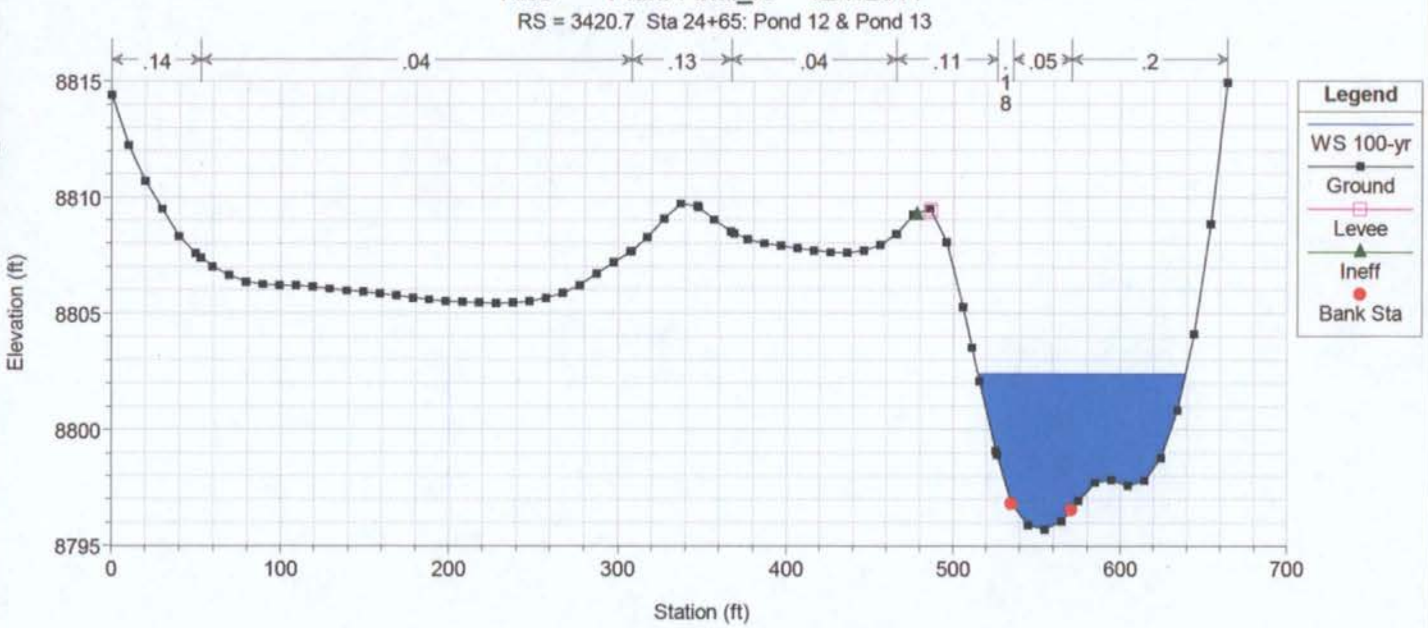
RS = 3973.5 Sta 30+17: Pond 15



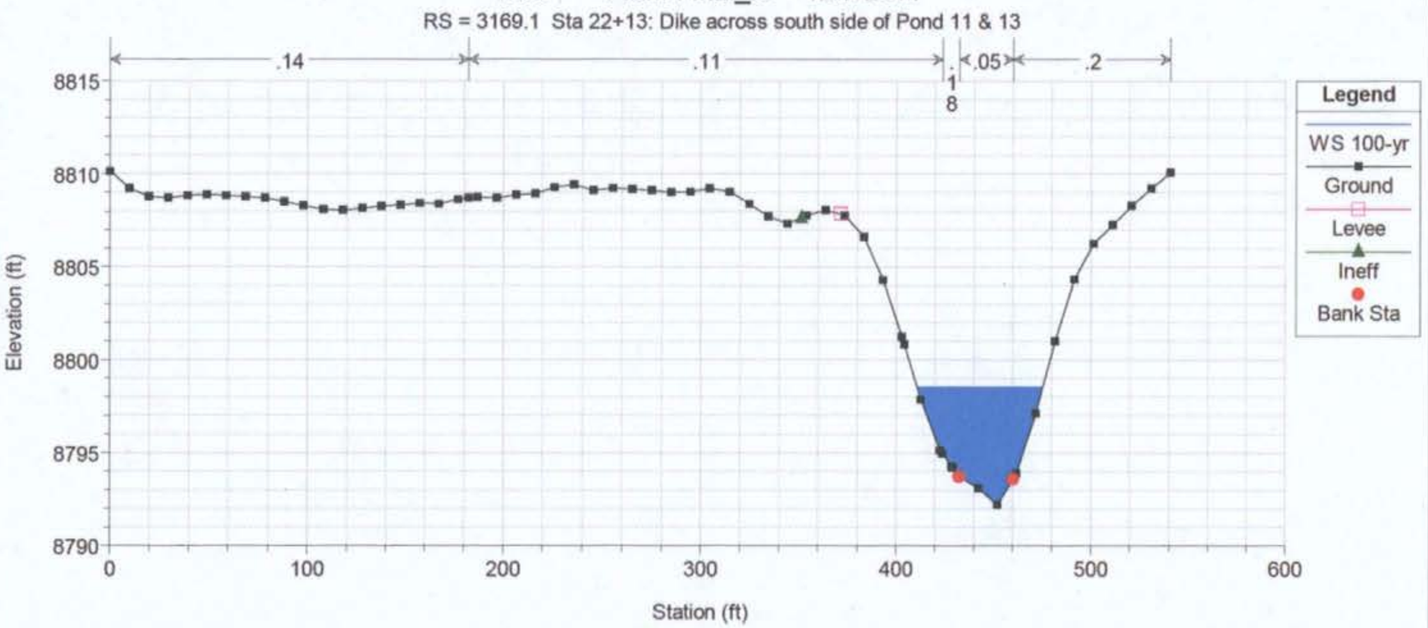
Rico Plan: Final_r5 12/7/2011

RS = 3647.8 Sta 26+92: Pond 14 & Pond 13

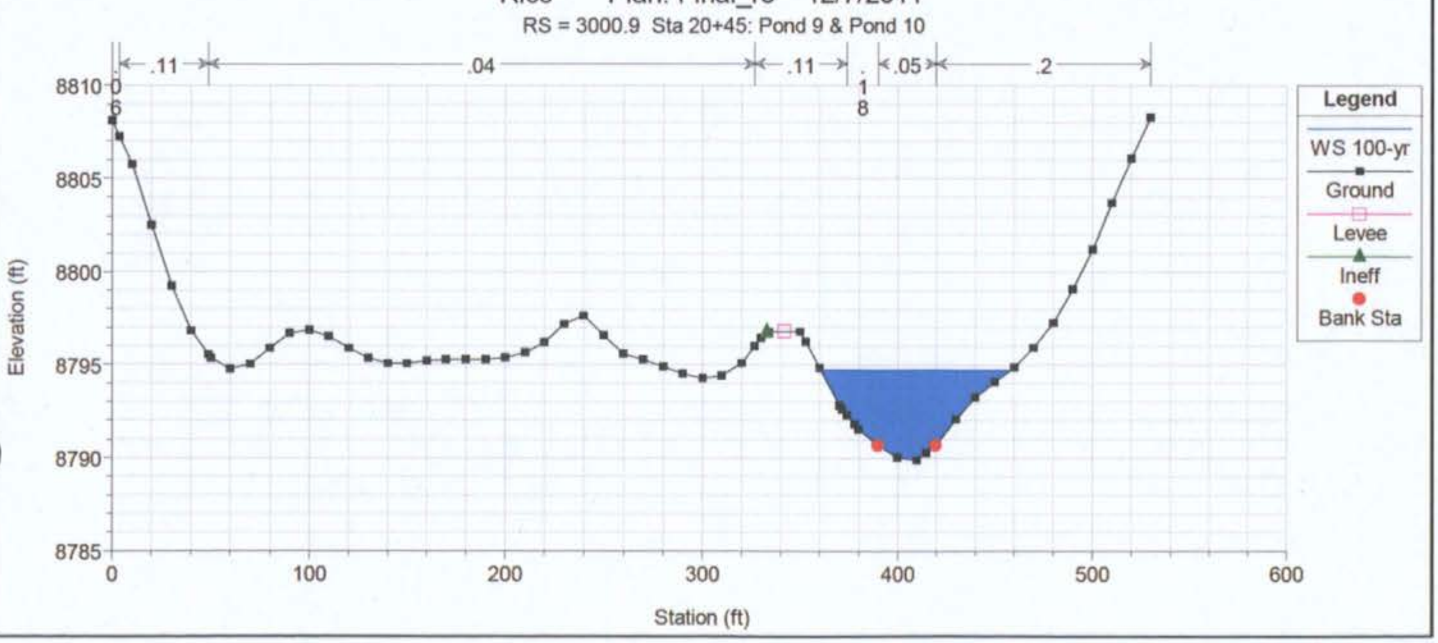



Rico Plan: Final_r5 12/7/2011

RS = 3420.7 Sta 24+65: Pond 12 & Pond 13


Rico Plan: Final_r5 12/7/2011

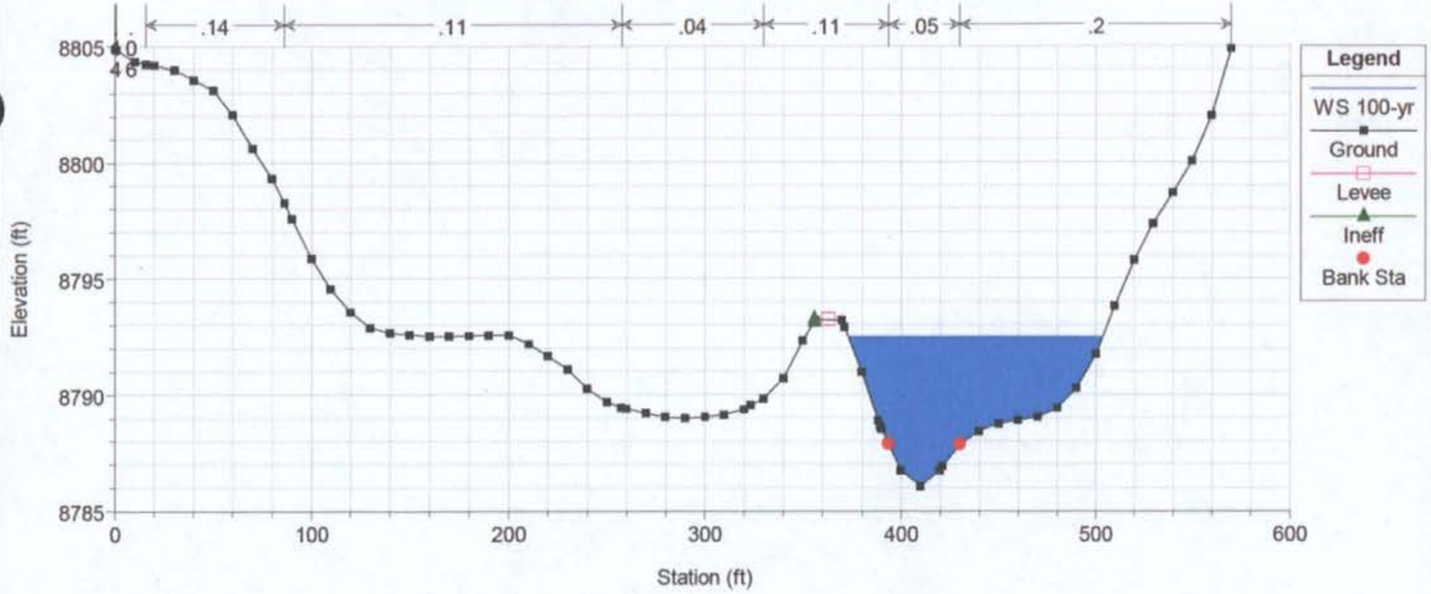
RS = 3169.1 Sta 22+13: Dike across south side of Pond 11 & 13


Rico Plan: Final_r5 12/7/2011

RS = 3000.9 Sta 20+45: Pond 9 & Pond 10

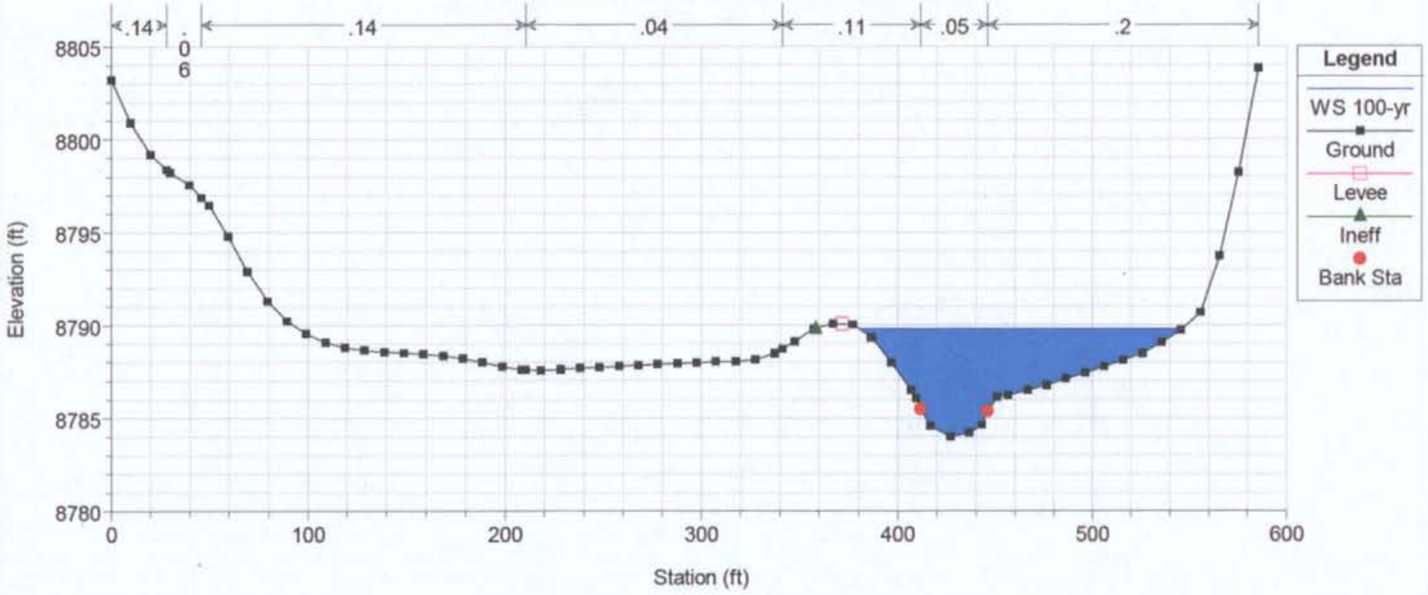
Rico Plan: Final_r5 12/7/2011

RS = 2855.1 Sta 18+99: Pond 8, Dike across south side of Pond 9 & 10



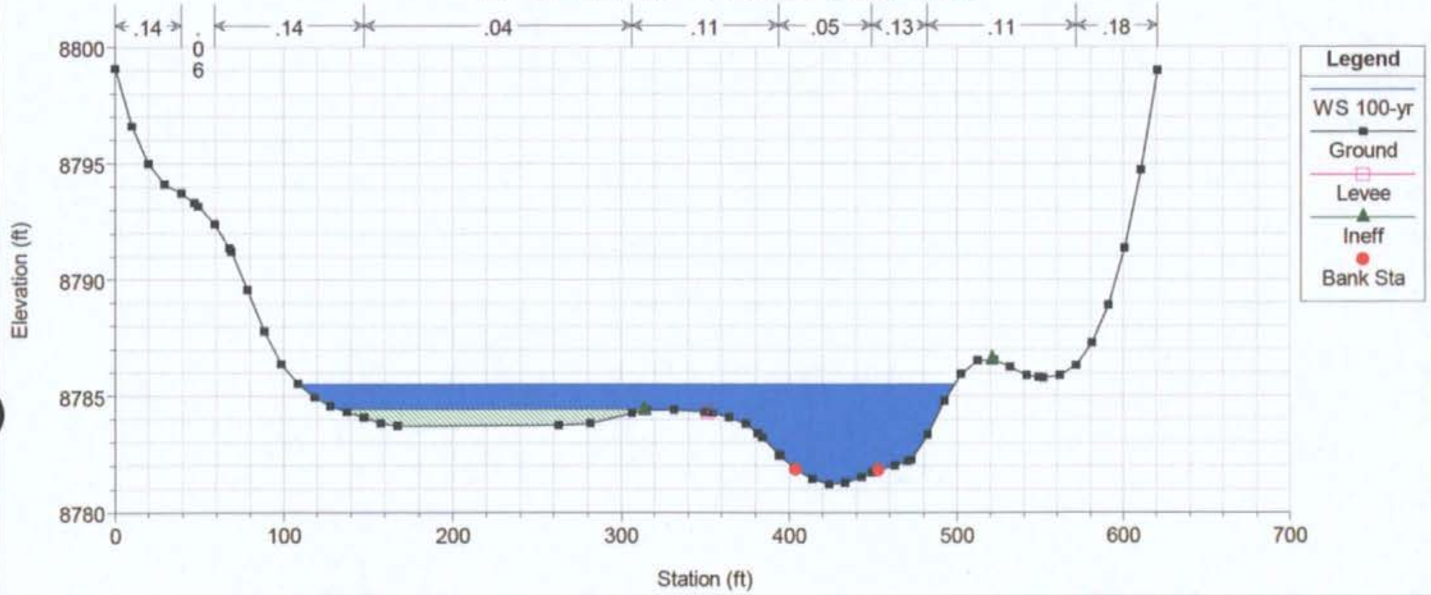
Rico Plan: Final_r5 12/7/2011

RS = 2712.3 Sta 17+56: Dike across south side of Pond 8



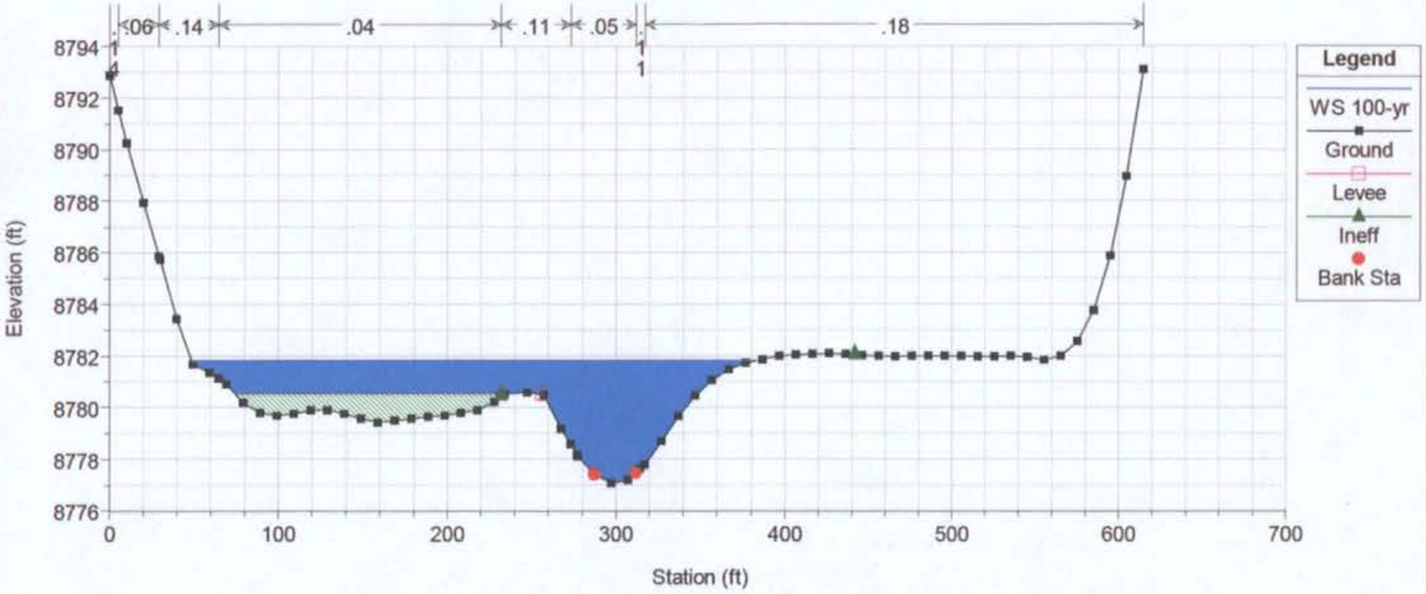
Rico Plan: Final_r5 12/7/2011

RS = 2468.5 Sta 15+12: Pond 7 just upstream of dike



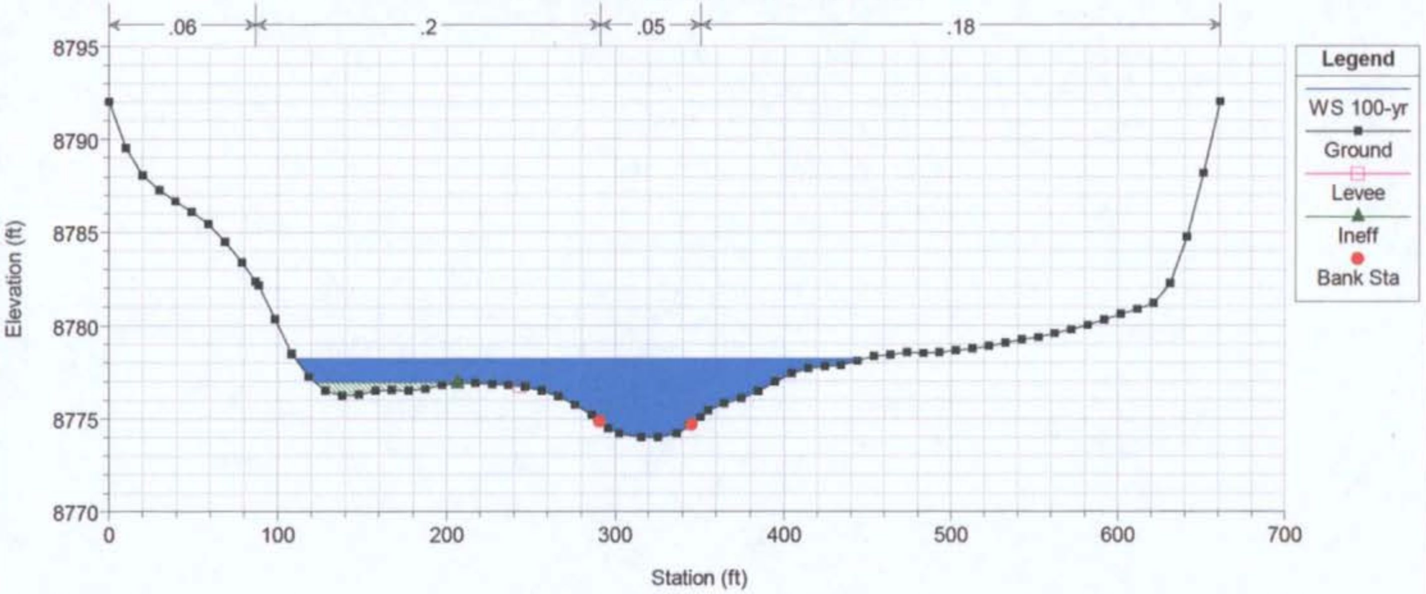
Rico Plan: Final_r5 12/7/2011

RS = 2279.5 Sta 13+23: Pond 6



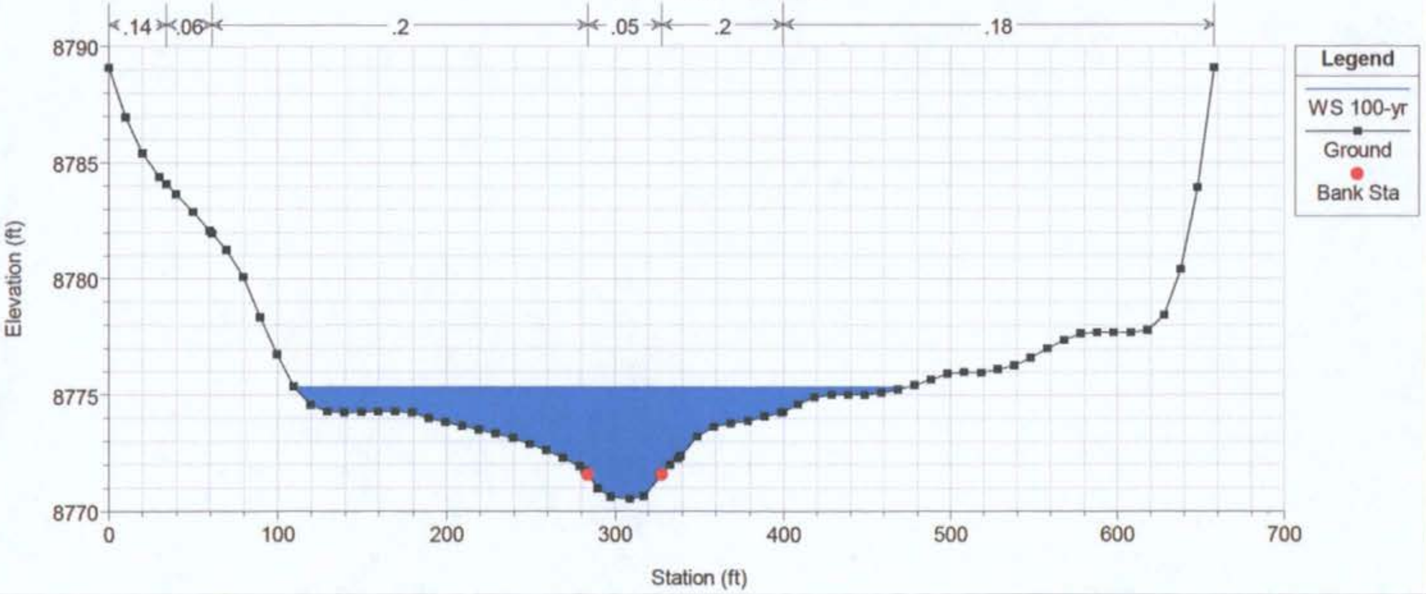
Rico Plan: Final_r5 12/7/2011

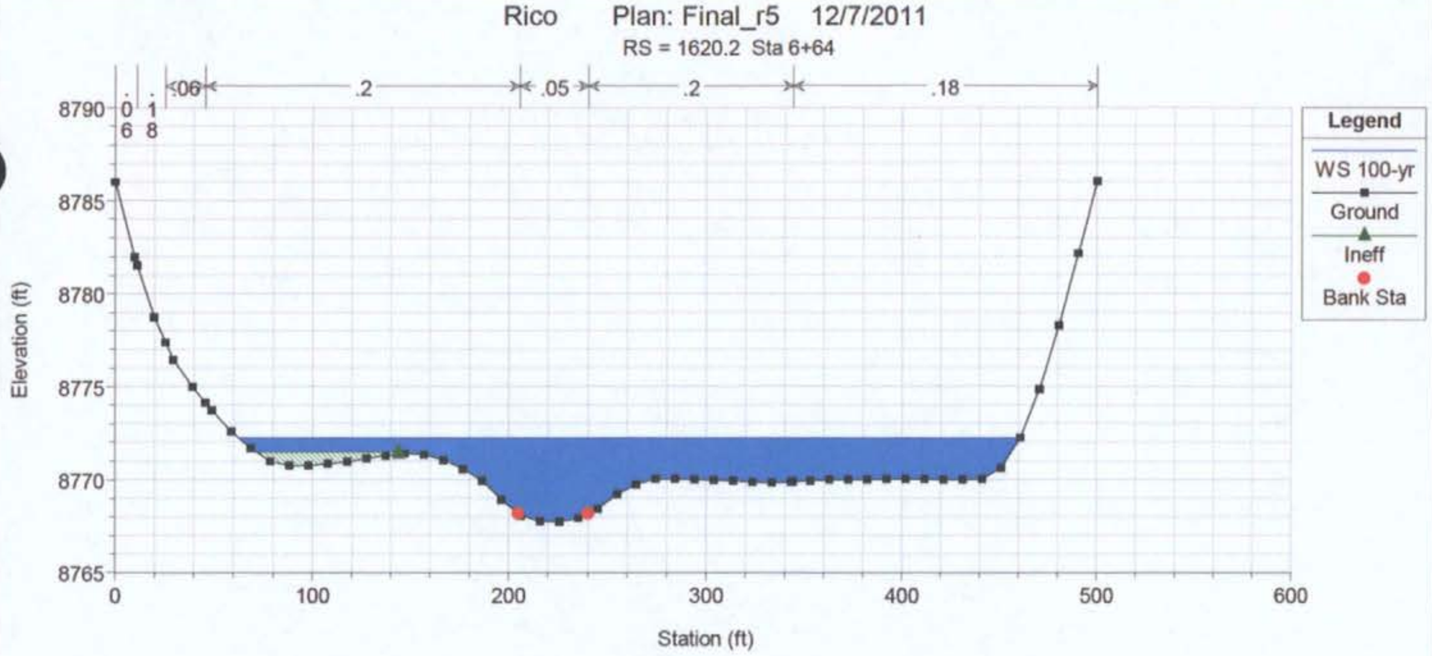
RS = 2067.2 Sta 11+11: Just D/S of Pond 5



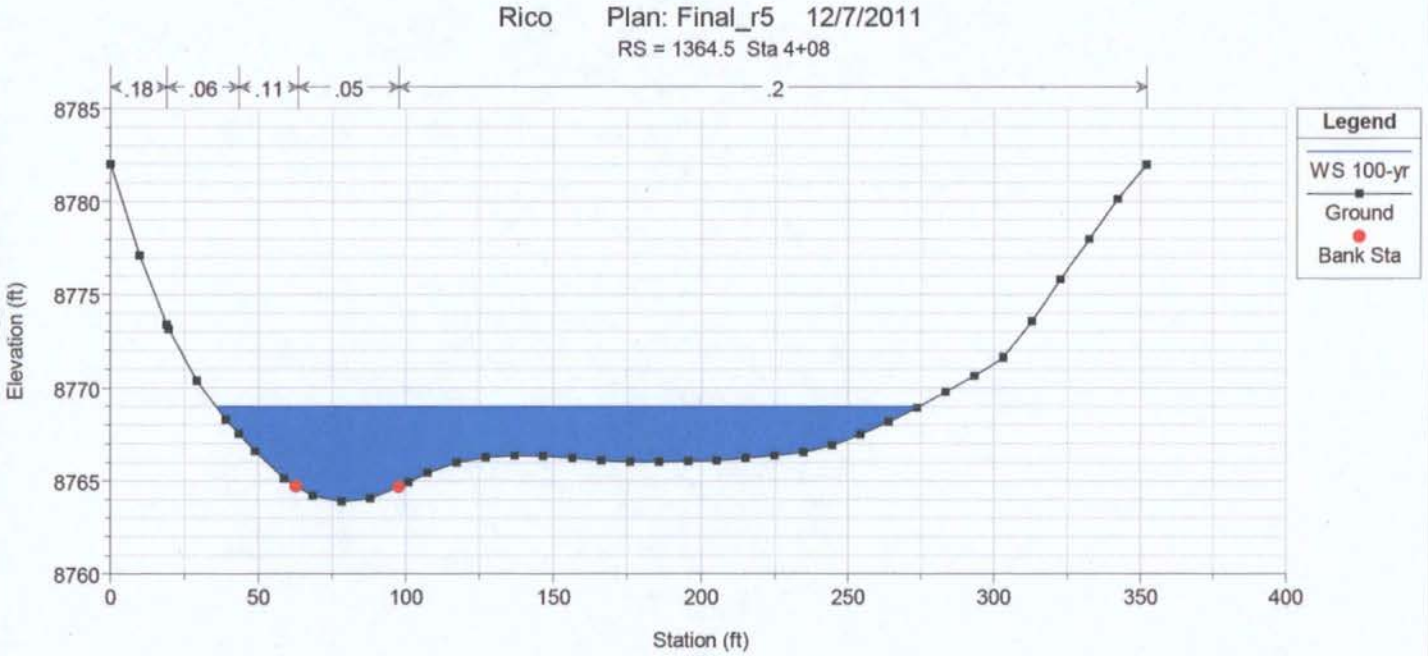
Rico Plan: Final_r5 12/7/2011

RS = 1873.1 Sta 9+17

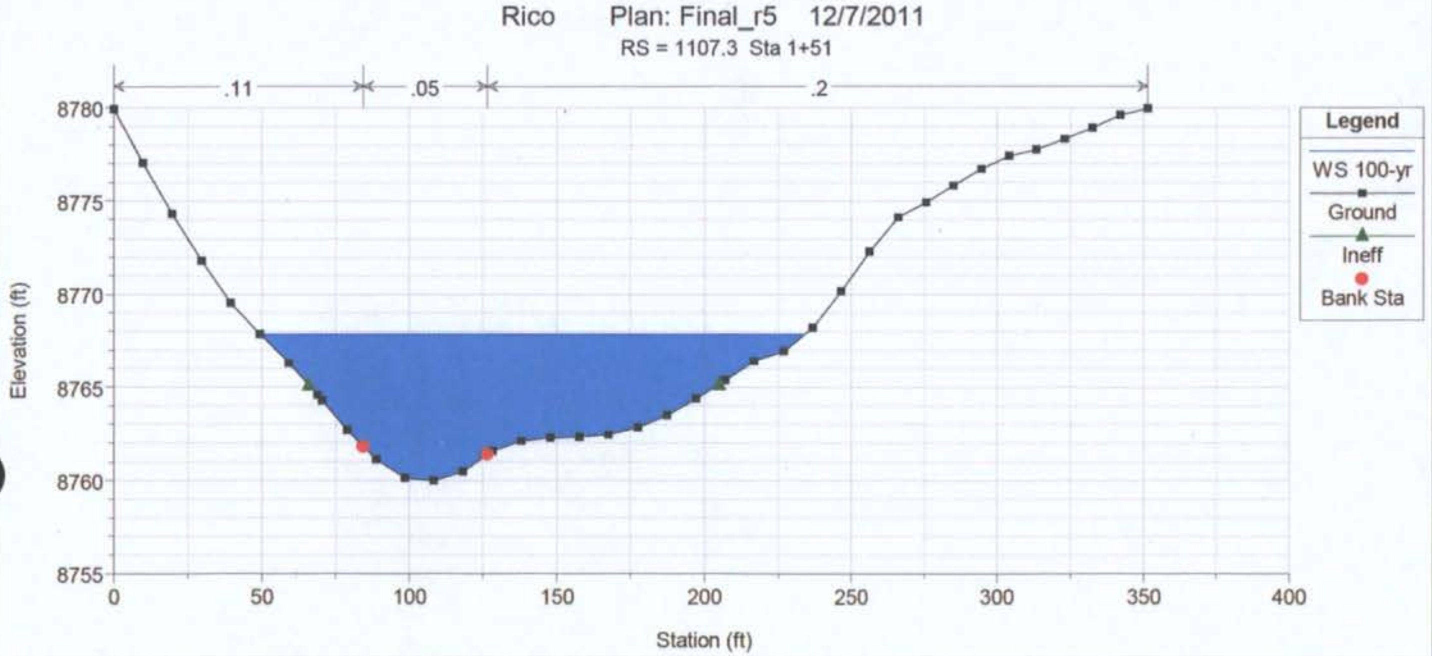




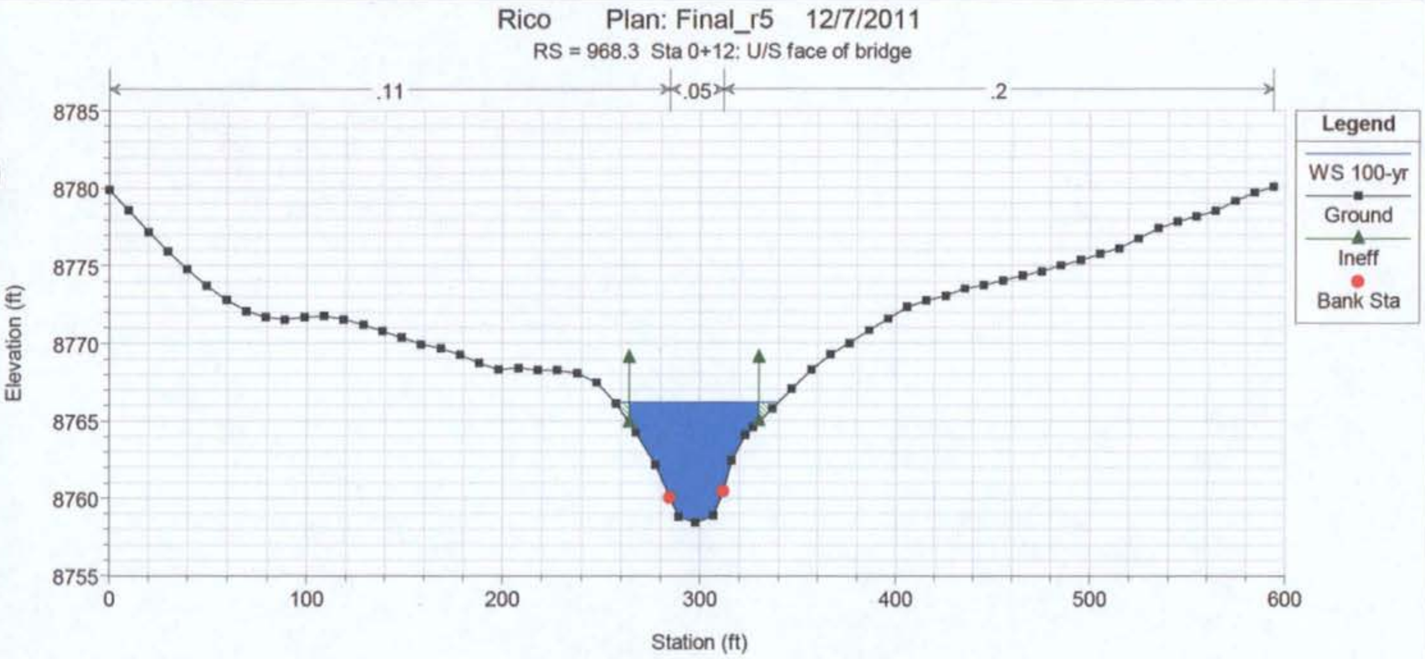
Rico Plan: Final_r5 12/7/2011
RS = 1620.2 Sta 6+64

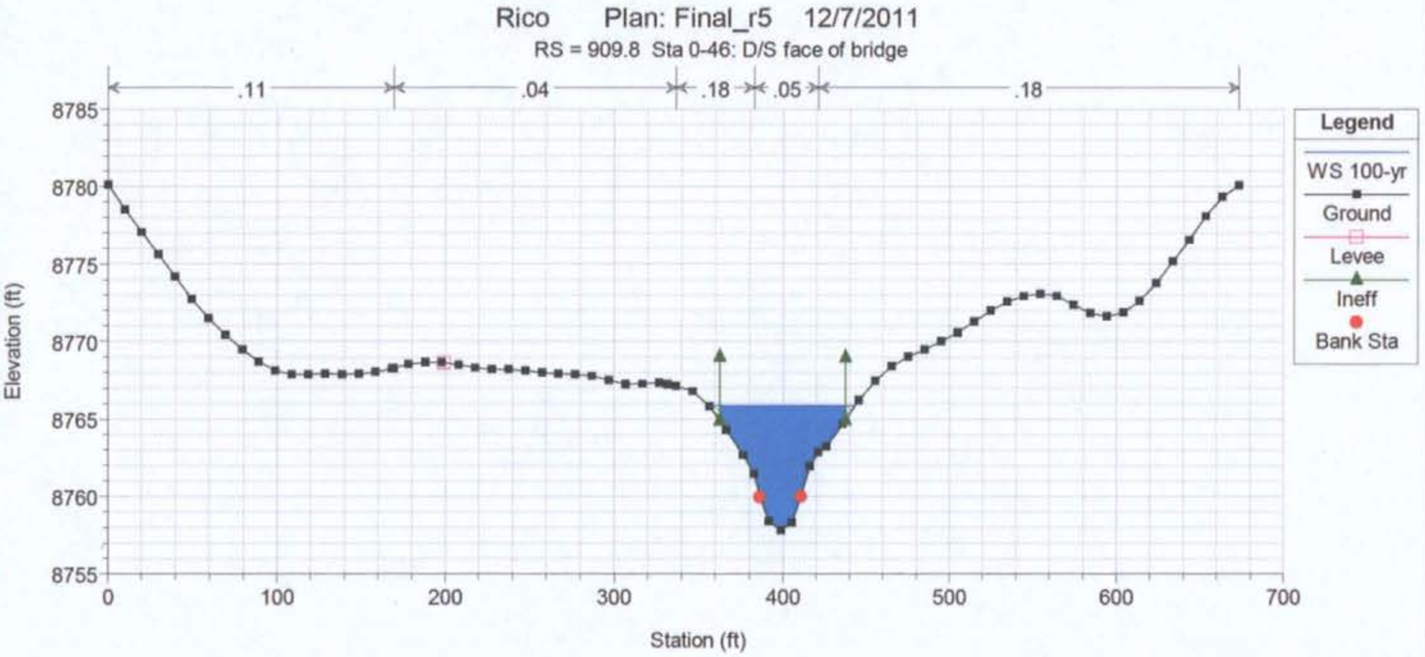


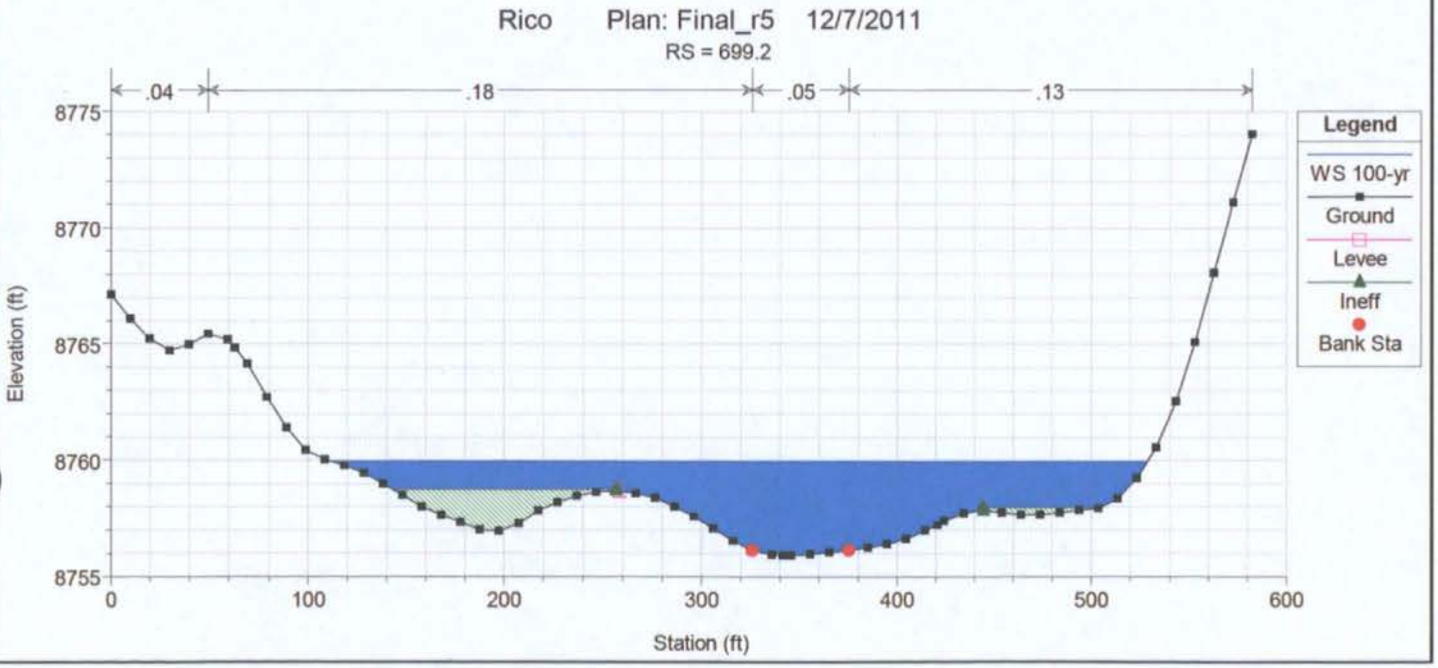
Rico Plan: Final_r5 12/7/2011
RS = 1364.5 Sta 4+08

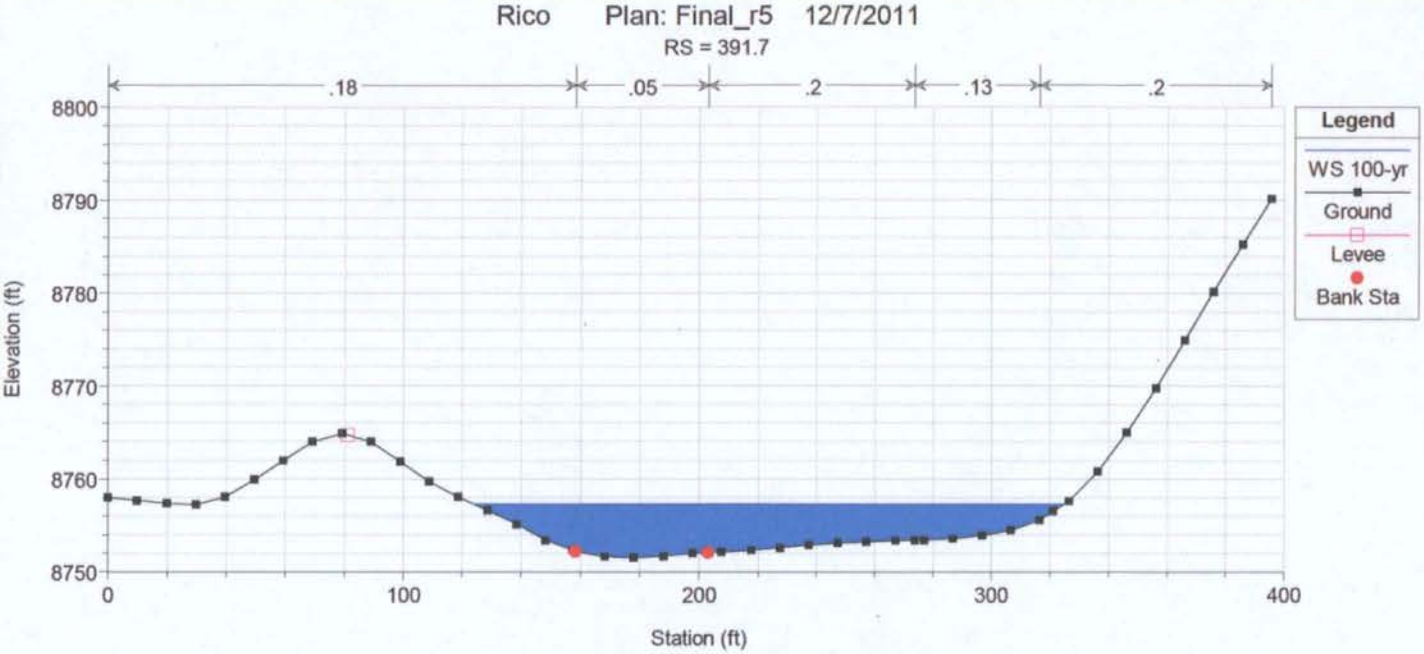


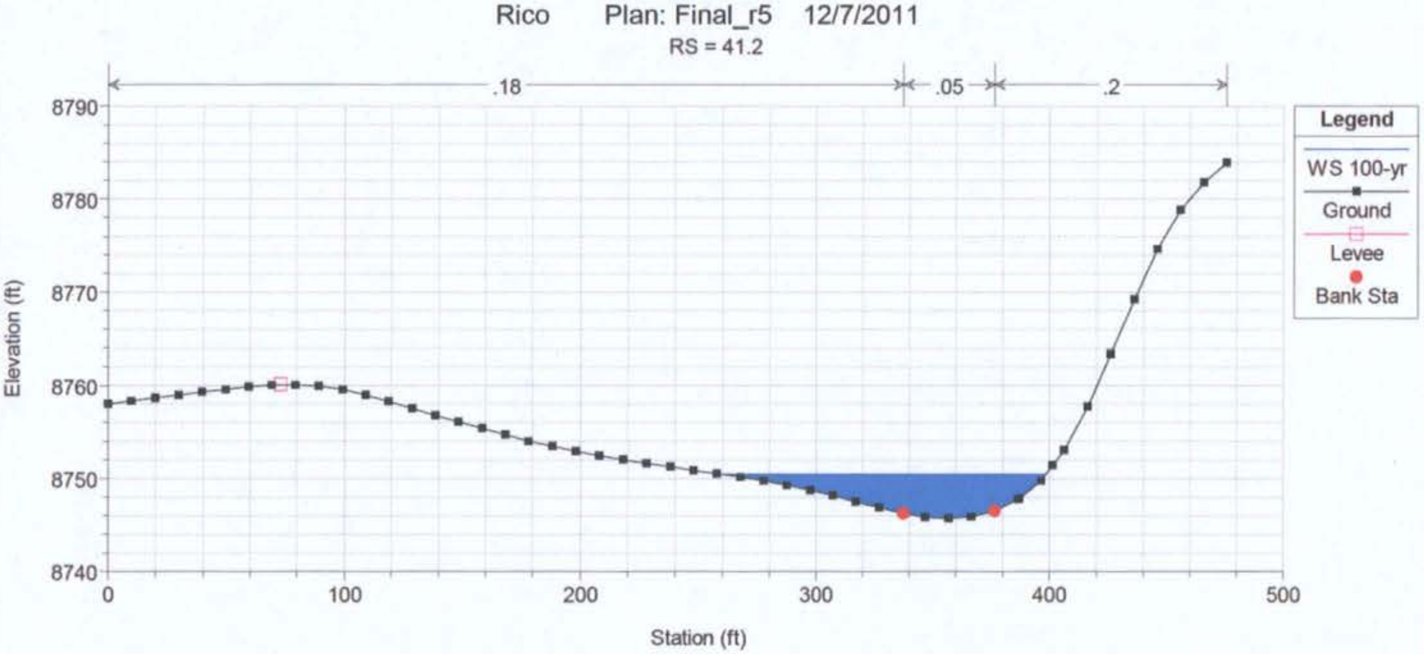
Rico Plan: Final_r5 12/7/2011
RS = 1107.3 Sta 1+51


Rico Plan: Final_r5 12/7/2011
RS = 968.3 Sta 0+12: U/S face of bridge
.11
.05
.2
Legend
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (ft)
8785
8780
8775
8770
8765
8760
8755
0
100
200
300
400
500
600
Station (ft)


Rico Plan: Final_r5 12/7/2011
RS = 909.8 Sta 0-46: D/S face of bridge
.11
.04
.18
.05
.18
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
8785
8780
8775
8770
8765
8760
8755
0
100
200
300
400
500
600
700
Station (ft)

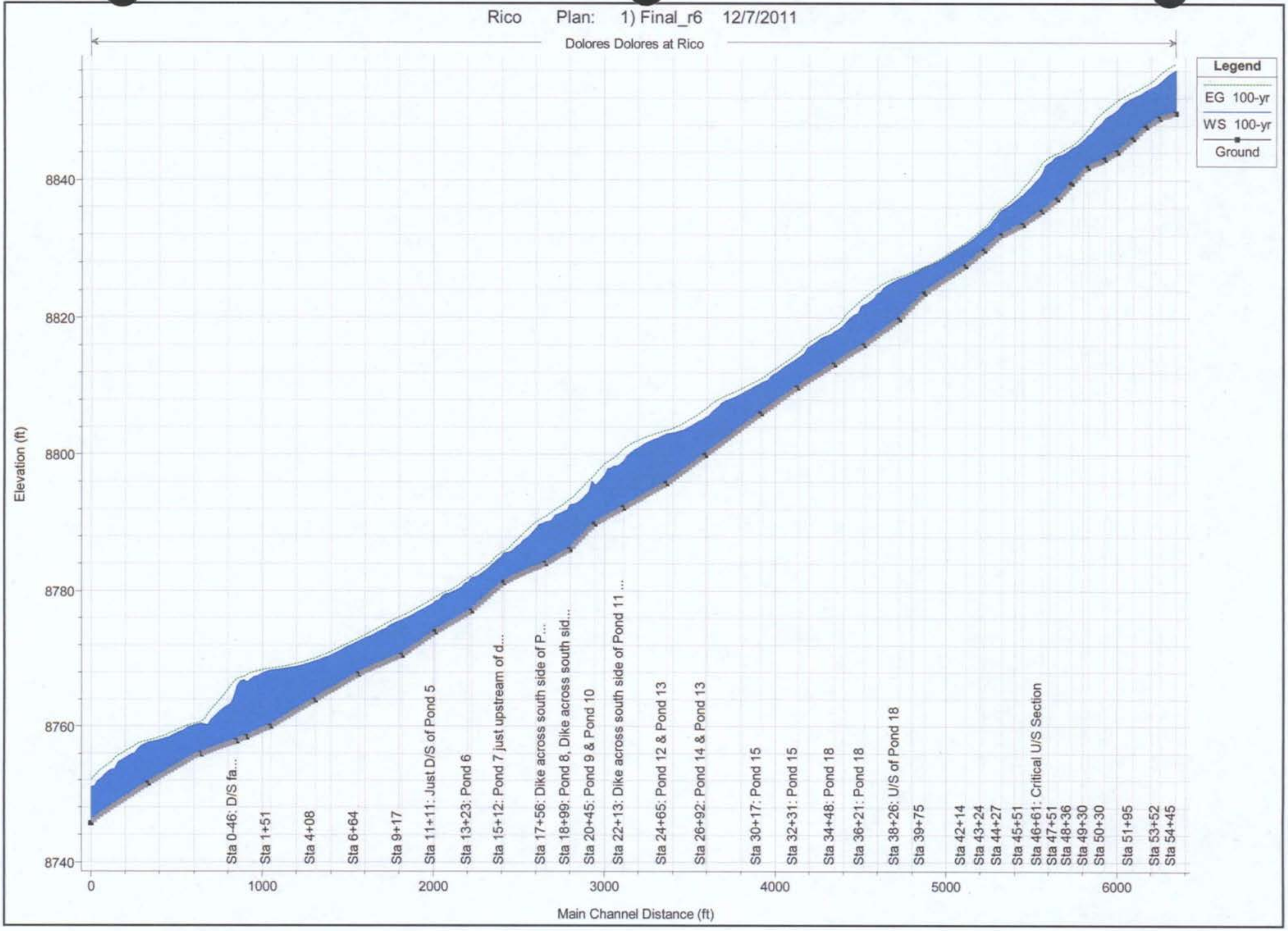

Rico Plan: Final_r5 12/7/2011
RS = 699.2
.04
.18
.05
.13
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
8775
8770
8765
8760
8755
0
100
200
300
400
500
600
Station (ft)


Rico Plan: Final_r5 12/7/2011
RS = 391.7
.18
.05
.2
.13
.2
Legend
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
8800
8790
8780
8770
8760
8750
0
100
200
300
400
Station (ft)


Rico Plan: Final_r5 12/7/2011
RS = 41.2
.18
.05
.2
Legend
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
8790
8780
8770
8760
8750
8740
0
100
200
300
400
500
Station (ft)

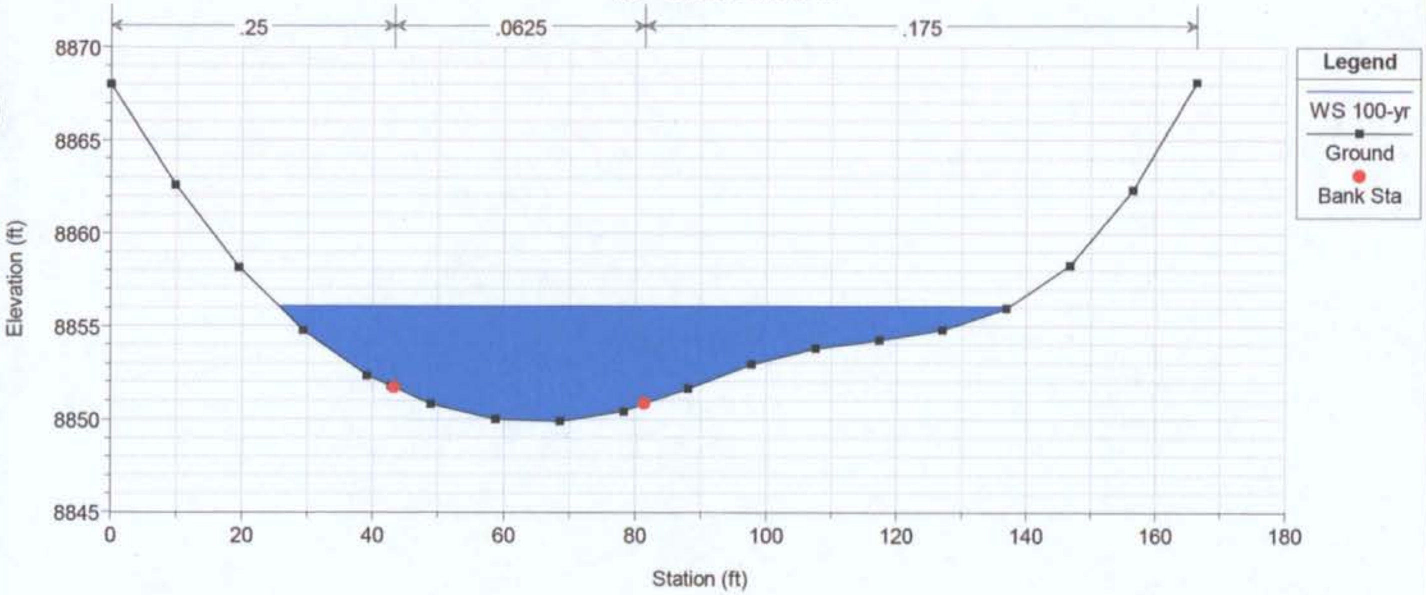
Plan Final_r6 Profile 100-year
Flow 2200 cfs

| River Sta | RAS River Sta | Slope Invert | Min Ch El (ft) | W.S. El (ft) | Max Chl Dpth (ft) | Crit W.S. (ft) | E.G. Elev (ft) | Vel Chnl (ft/s) | Vel Total (ft/s) | Top Width (ft) | Mann Wtd Left | Mann Wtd Chnl | Mann Wtd Rght | Froude # Chnl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54+44.5 | 6400.6 | 0.0081 | 8849.9 | 8856.1 | 6.2 | 8855.0 | 8857.1 | 8.76 | 5.52 | 111.8 | 0.250 | 0.063 | 0.175 | 0.65 |
| 53+51.9 | 6308.0 | 0.0171 | 8849.1 | 8854.3 | 5.1 | | 8855.5 | 10.39 | 5.45 | 116.1 | 0.250 | 0.063 | 0.174 | 0.82 |
| 52+72.5 | 6228.6 | 0.0215 | 8847.8 | 8853.1 | 5.4 | | 8854.0 | 8.12 | 4.51 | 134.6 | 0.250 | 0.063 | 0.250 | 0.64 |
| 51+94.5 | 6150.6 | 0.0216 | 8846.1 | 8852.2 | 6.1 | 8850.7 | 8853.0 | 7.83 | 4.64 | 129.4 | 0.250 | 0.063 | 0.250 | 0.59 |
| 51+04.5 | 6060.6 | 0.0140 | 8844.1 | 8850.3 | 6.2 | 8849.6 | 8851.8 | 10.31 | 5.93 | 108.1 | 0.250 | 0.063 | 0.250 | 0.76 |
| 50+30.0 | 5986.1 | 0.0151 | 8843.1 | 8849.1 | 6.0 | 8848.4 | 8850.4 | 9.75 | 5.12 | 134.8 | 0.250 | 0.063 | 0.250 | 0.73 |
| 49+30.7 | 5886.8 | 0.0216 | 8841.9 | 8846.6 | 5.6 | 8845.9 | 8847.4 | 10.70 | 3.44 | 197.6 | 0.250 | 0.063 | 0.100 | 0.88 |
| 48+35.7 | 5791.8 | 0.0300 | 8839.5 | 8844.7 | 5.7 | | 8845.1 | 8.30 | 2.51 | 258.8 | 0.249 | 0.063 | 0.100 | 0.66 |
| 47+50.6 | 5706.7 | 0.0211 | 8837.3 | 8843.5 | 6.8 | | 8843.9 | 7.28 | 2.57 | 195.8 | 0.248 | 0.063 | 0.100 | 0.53 |
| 46+60.7 | 5616.8 | 0.0198 | 8835.5 | 8840.9 | 5.5 | 8840.9 | 8842.6 | 12.90 | 4.82 | 136.5 | 0.245 | 0.063 | 0.200 | 1.00 |
| 45+51.3 | 5507.4 | 0.0124 | 8833.5 | 8837.9 | 5.9 | 8837.4 | 8839.0 | 10.71 | 4.20 | 168.8 | 0.244 | 0.063 | 0.250 | 0.92 |
| 44+26.5 | 5382.6 | 0.0223 | 8832.1 | 8835.7 | 8.3 | 8832.6 | 8836.0 | 6.72 | 2.94 | 189.2 | 0.241 | 0.063 | 0.250 | 0.64 |
| 43+24.3 | 5280.4 | 0.0201 | 8829.8 | 8832.9 | 7.6 | 8830.6 | 8833.2 | 6.38 | 3.70 | 178.2 | 0.183 | 0.063 | 0.250 | 0.67 |
| 42+14.0 | 5170.1 | 0.0166 | 8827.5 | 8830.7 | 6.9 | 8828.4 | 8830.9 | 6.30 | 3.12 | 251.2 | 0.183 | 0.063 | 0.225 | 0.64 |
| 39+75.4 | 4931.5 | 0.0257 | 8823.6 | 8827.3 | 6.3 | 8824.4 | 8827.5 | 5.09 | 2.34 | 297.1 | 0.194 | 0.063 | 0.225 | 0.49 |
| 38+25.6 | 4781.7 | 0.0188 | 8819.8 | 8825.7 | 5.9 | 8823.8 | 8826.0 | 6.56 | 2.15 | 403.6 | 0.217 | 0.063 | 0.225 | 0.49 |
| 36+21.3 | 4577.4 | 0.0161 | 8816.0 | 8821.9 | 5.9 | 8820.9 | 8823.0 | 9.38 | 3.85 | 278.8 | 0.244 | 0.063 | 0.225 | 0.69 |
| 34+48.0 | 4404.1 | 0.0137 | 8813.2 | 8818.0 | 4.9 | 8817.3 | 8818.8 | 8.14 | 3.56 | 259.0 | 0.250 | 0.063 | 0.172 | 0.66 |
| 32+30.9 | 4187.0 | 0.0175 | 8809.8 | 8814.2 | 4.3 | 8813.3 | 8814.8 | 8.30 | 4.52 | 164.0 | 0.216 | 0.063 | 0.153 | 0.73 |
| 30+17.4 | 3973.5 | 0.0188 | 8806.0 | 8810.5 | 4.5 | 8809.3 | 8811.1 | 7.00 | 3.67 | 174.6 | 0.239 | 0.063 | 0.249 | 0.59 |
| 26+91.7 | 3647.8 | 0.0185 | 8799.9 | 8805.4 | 5.5 | 8804.6 | 8806.7 | 9.61 | 6.31 | 90.6 | 0.250 | 0.063 | 0.250 | 0.74 |
| 24+64.6 | 3420.7 | 0.0139 | 8795.7 | 8803.0 | 7.3 | 8800.5 | 8803.5 | 6.81 | 3.41 | 128.4 | 0.194 | 0.063 | 0.250 | 0.46 |
| 22+13.0 | 3169.1 | 0.0140 | 8792.2 | 8799.0 | 6.8 | 8798.5 | 8800.8 | 11.48 | 7.63 | 67.2 | 0.187 | 0.063 | 0.250 | 0.82 |
| 20+44.8 | 3000.9 | 0.0264 | 8789.9 | 8795.5 | 5.6 | 8795.3 | 8797.1 | 11.29 | 6.20 | 109.3 | 0.199 | 0.063 | 0.250 | 0.86 |
| 18+99.0 | 2855.1 | 0.0134 | 8786.1 | 8792.7 | 6.6 | 8791.4 | 8793.5 | 8.27 | 4.35 | 131.9 | 0.138 | 0.063 | 0.250 | 0.60 |
| 17+56.2 | 2712.3 | 0.0102 | 8784.0 | 8790.1 | 6.1 | 8789.3 | 8791.0 | 8.48 | 3.46 | 459.5 | 0.104 | 0.063 | 0.250 | 0.62 |
| 15+12.4 | 2468.5 | 0.0222 | 8781.2 | 8785.6 | 4.4 | 8785.1 | 8785.8 | 5.31 | 3.10 | 391.5 | 0.072 | 0.065 | 0.160 | 0.46 |
| 13+23.4 | 2279.5 | 0.0165 | 8777.1 | 8782.0 | 4.9 | 8781.5 | 8782.3 | 6.49 | 3.53 | 365.3 | 0.062 | 0.063 | 0.187 | 0.52 |
| 11+11.1 | 2067.2 | 0.0237 | 8774.0 | 8778.5 | 4.5 | 8777.7 | 8779.1 | 7.00 | 3.05 | 359.0 | 0.250 | 0.063 | 0.146 | 0.60 |
| 9+17.0 | 1873.1 | 0.0108 | 8770.5 | 8775.7 | 5.2 | | 8776.4 | 7.42 | 2.73 | 383.8 | 0.250 | 0.063 | 0.246 | 0.59 |
| 6+64.1 | 1620.2 | 0.0147 | 8767.7 | 8772.6 | 4.9 | | 8773.1 | 7.24 | 2.22 | 403.8 | 0.250 | 0.063 | 0.238 | 0.58 |
| 4+08.4 | 1364.5 | 0.0152 | 8763.9 | 8769.6 | 5.8 | | 8770.1 | 6.95 | 2.62 | 248.7 | 0.130 | 0.063 | 0.250 | 0.52 |
| 1+51.2 | 1107.3 | 0.0111 | 8760.0 | 8768.3 | 8.3 | | 8768.6 | 5.04 | 2.38 | 190.2 | 0.138 | 0.063 | 0.250 | 0.32 |
| 0+12.2 | 968.3 | 0.0103 | 8758.4 | 8766.5 | 8.1 | | 8767.7 | 9.31 | 6.45 | 87.8 | 0.137 | 0.063 | 0.250 | 0.60 |
| -0+46.3 | 909.8 | 0.0089 | 8757.8 | 8766.1 | 8.2 | 8764.6 | 8767.1 | 9.12 | 6.45 | 90.3 | 0.123 | 0.063 | 0.084 | 0.59 |
| -2+56.9 | 699.2 | 0.0062 | 8755.9 | 8760.4 | 4.5 | 8759.3 | 8760.7 | 5.51 | 2.09 | 431.5 | 0.225 | 0.063 | 0.162 | 0.46 |
| -5+64.4 | 391.7 | 0.0167 | 8751.5 | 8757.6 | 6.1 | 8755.4 | 8757.9 | 5.57 | 2.55 | 204.8 | 0.225 | 0.063 | 0.218 | 0.41 |
| -9+14.9 | 41.2 | | 8745.7 | 8751.0 | 5.3 | 8750.2 | 8752.1 | 9.20 | 4.80 | 156.2 | 0.225 | 0.063 | 0.250 | 0.72 |


Rico Plan: 1) Final_r6 12/7/2011
Dolores Dolores at Rico
Legend
EG 100-yr
WS 100-yr
Ground
Elevation (ft)
8840
8820
8800
8780
8760
8740
Main Channel Distance (ft)
0
1000
2000
3000
4000
5000
6000
Sta 0-46: D/S fa...
Sta 1+51
Sta 4+08
Sta 6+64
Sta 9+17
Sta 11+11: Just D/S of Pond 5
Sta 13+23: Pond 6
Sta 15+12: Pond 7 just upstream of d...
Sta 17+56: Dike across south side of P...
Sta 18+99: Pond 8, Dike across south sid...
Sta 20+45: Pond 9 & Pond 10
Sta 22+13: Dike across south side of Pond 11 ...
Sta 24+65: Pond 12 & Pond 13
Sta 26+92: Pond 14 & Pond 13
Sta 30+17: Pond 15
Sta 32+31: Pond 15
Sta 34+48: Pond 18
Sta 36+21: Pond 18
Sta 38+26: U/S of Pond 18
Sta 39+75
Sta 42+14
Sta 43+24
Sta 44+27
Sta 45+51
Sta 46+61: Critical U/S Section
Sta 47+51
Sta 48+36
Sta 49+30
Sta 50+30
Sta 51+95
Sta 53+52
Sta 54+45

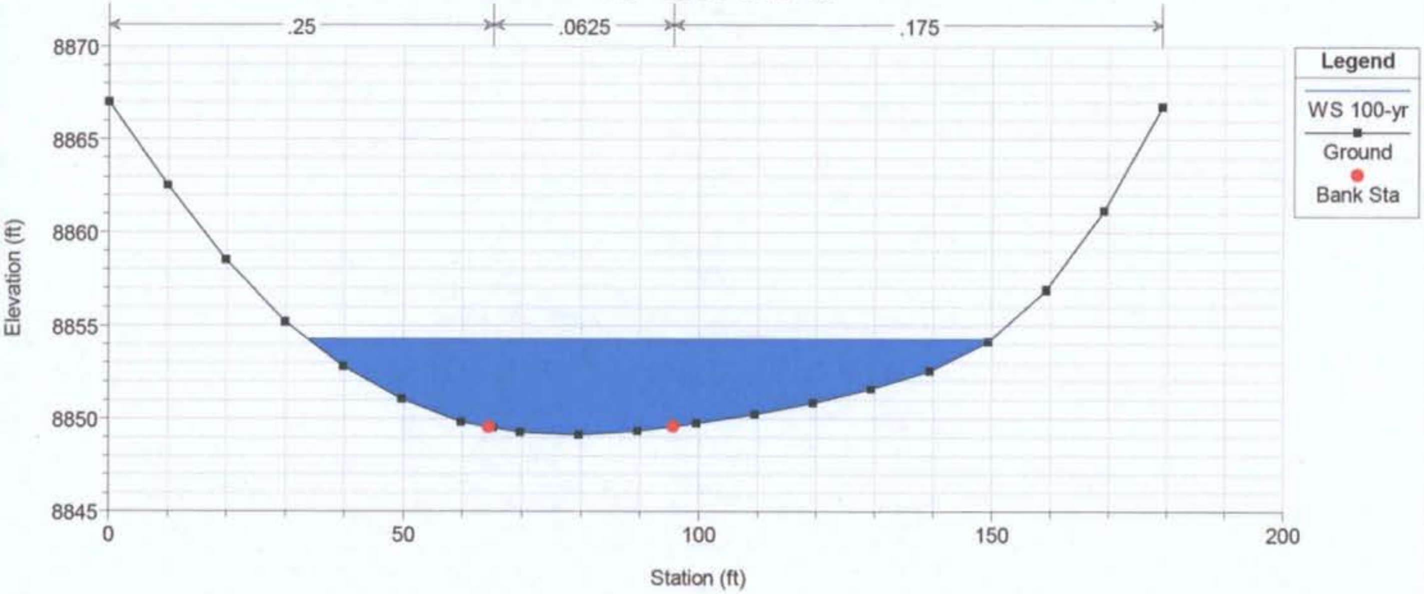
Rico Plan: Final_r6 12/7/2011

RS = 6400.6 Sta 54+45



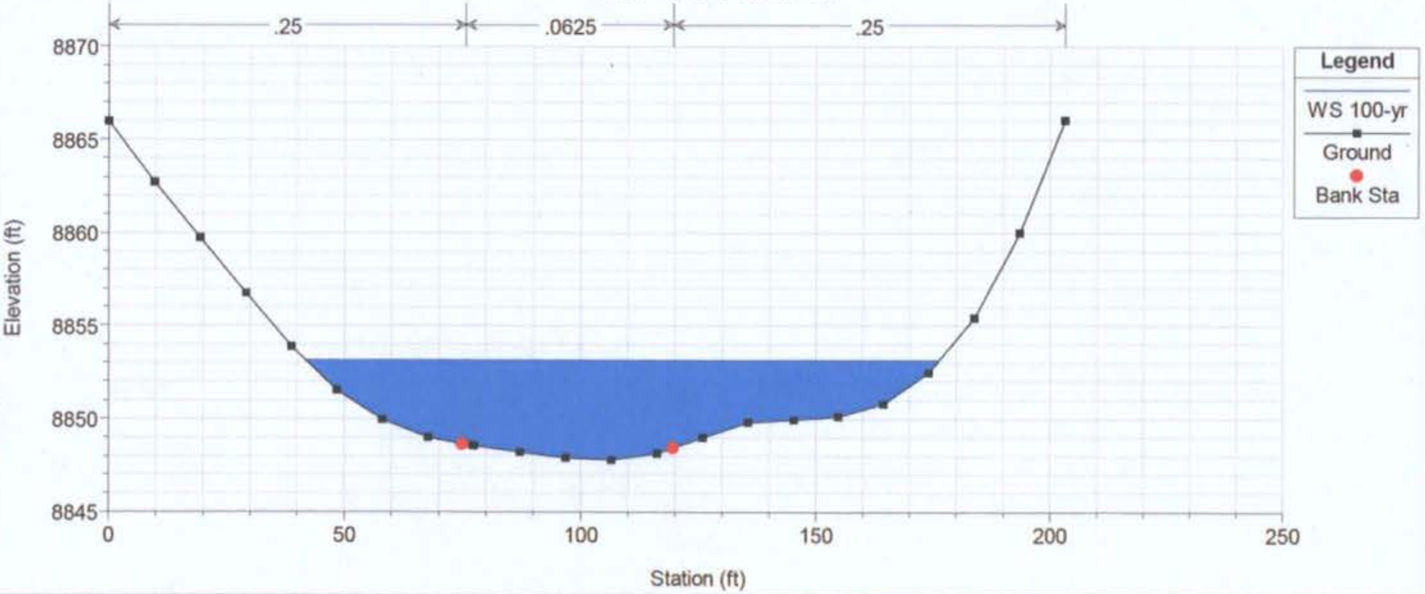
Rico Plan: Final_r6 12/7/2011

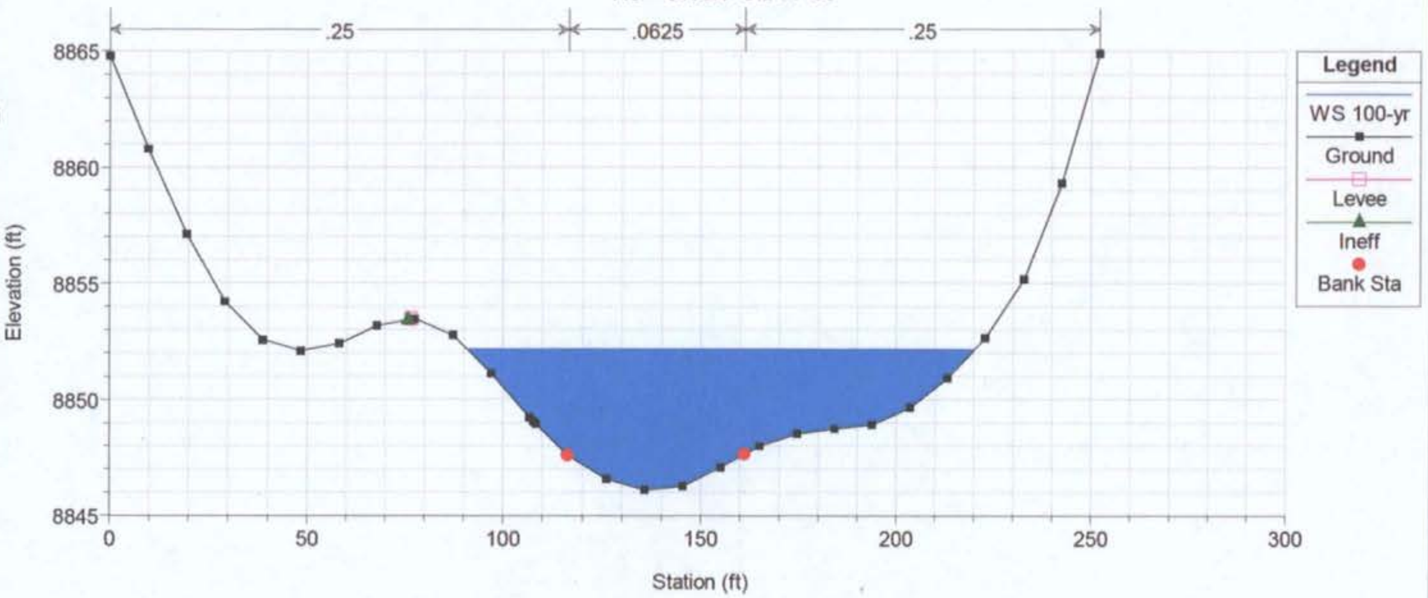
RS = 6308.0 Sta 53+52

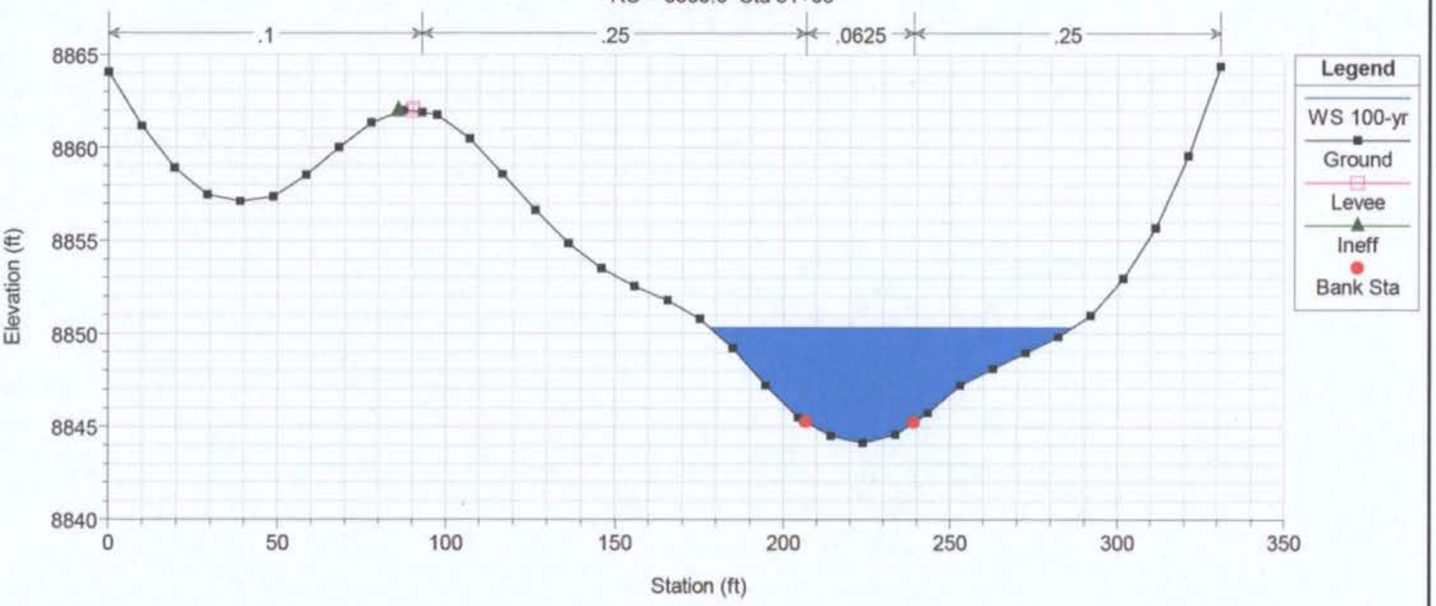


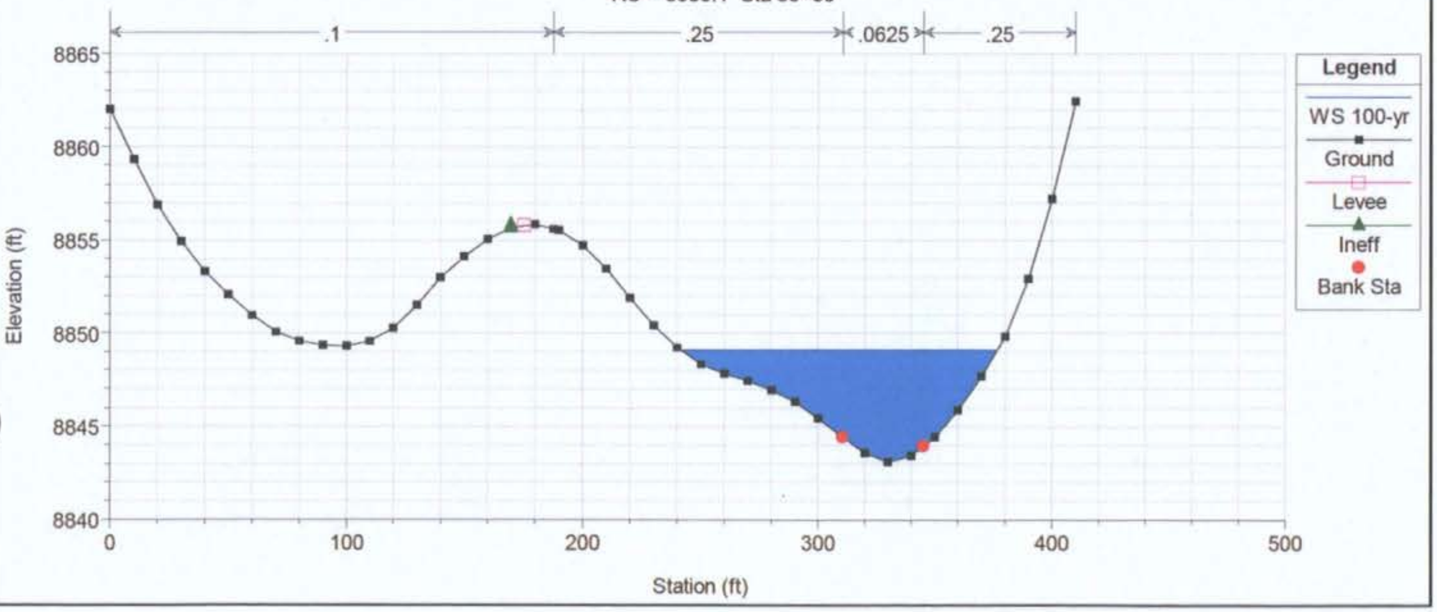
Rico Plan: Final_r6 12/7/2011

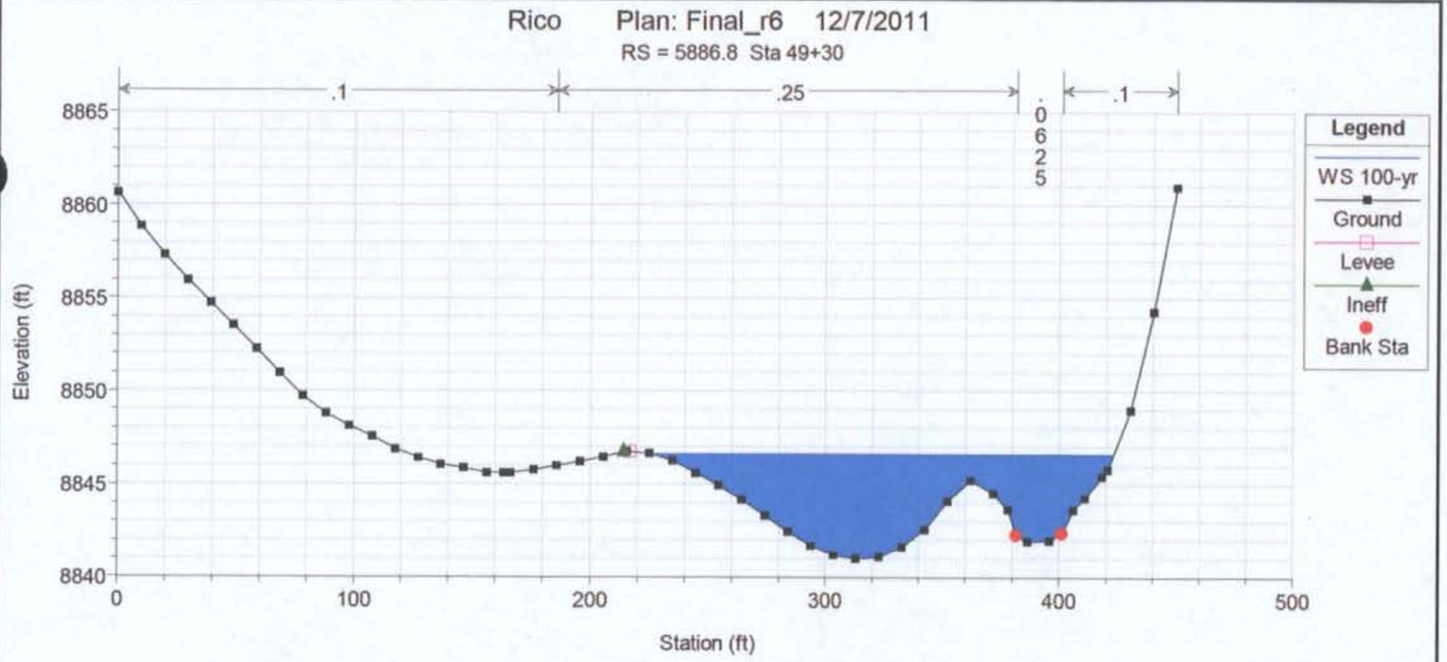
RS = 6228.6 Sta 52+73

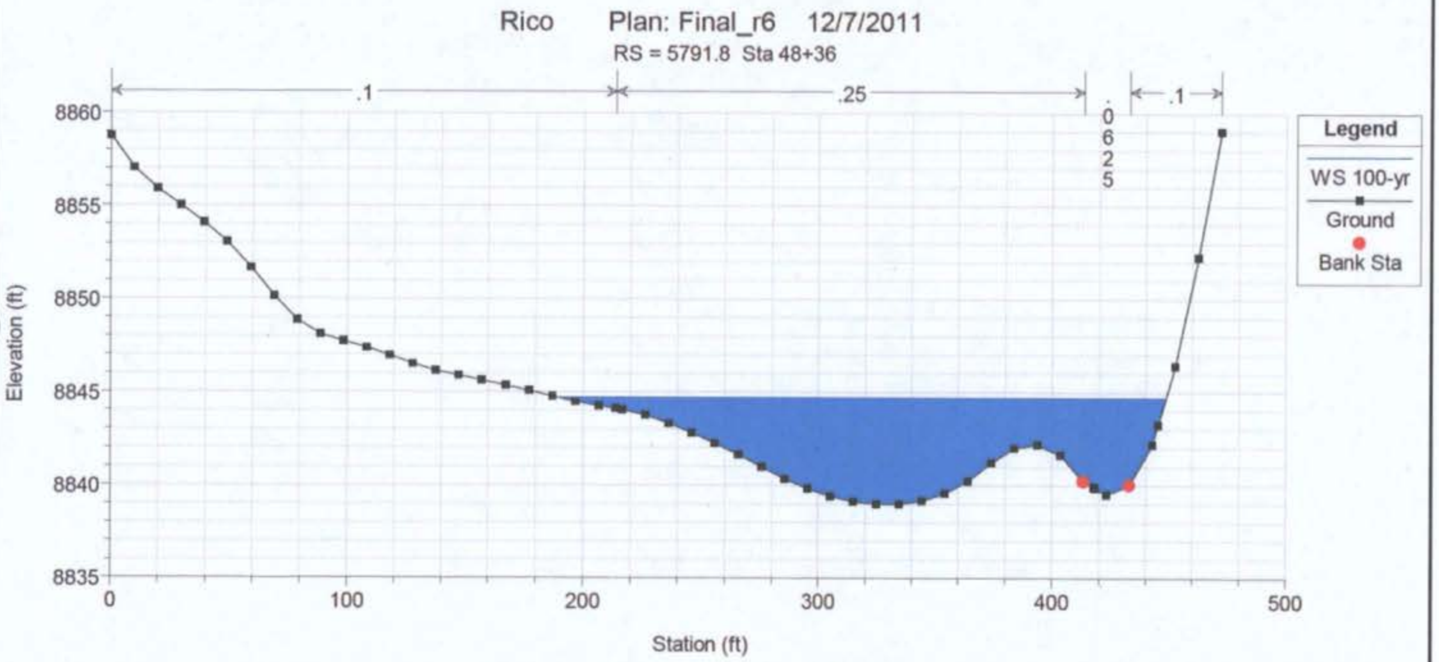


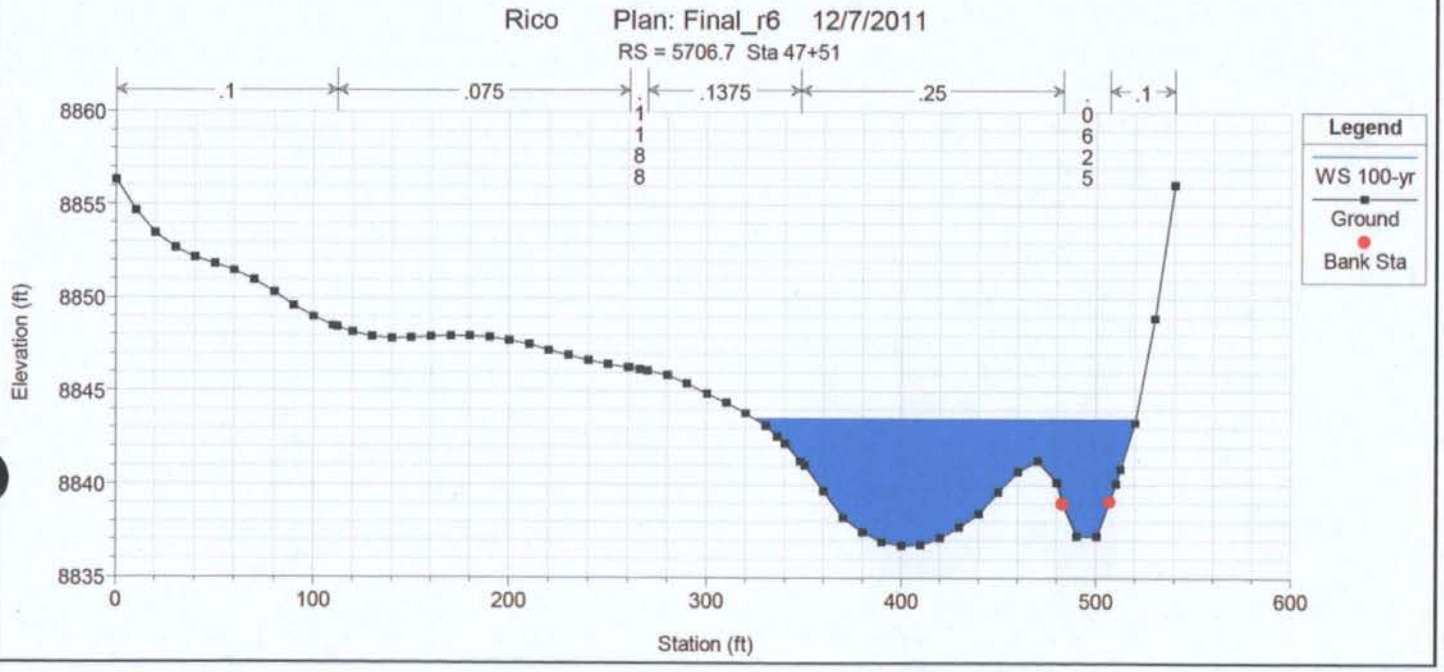

Rico Plan: Final_r6 12/7/2011
RS = 6150.6 Sta 51+95

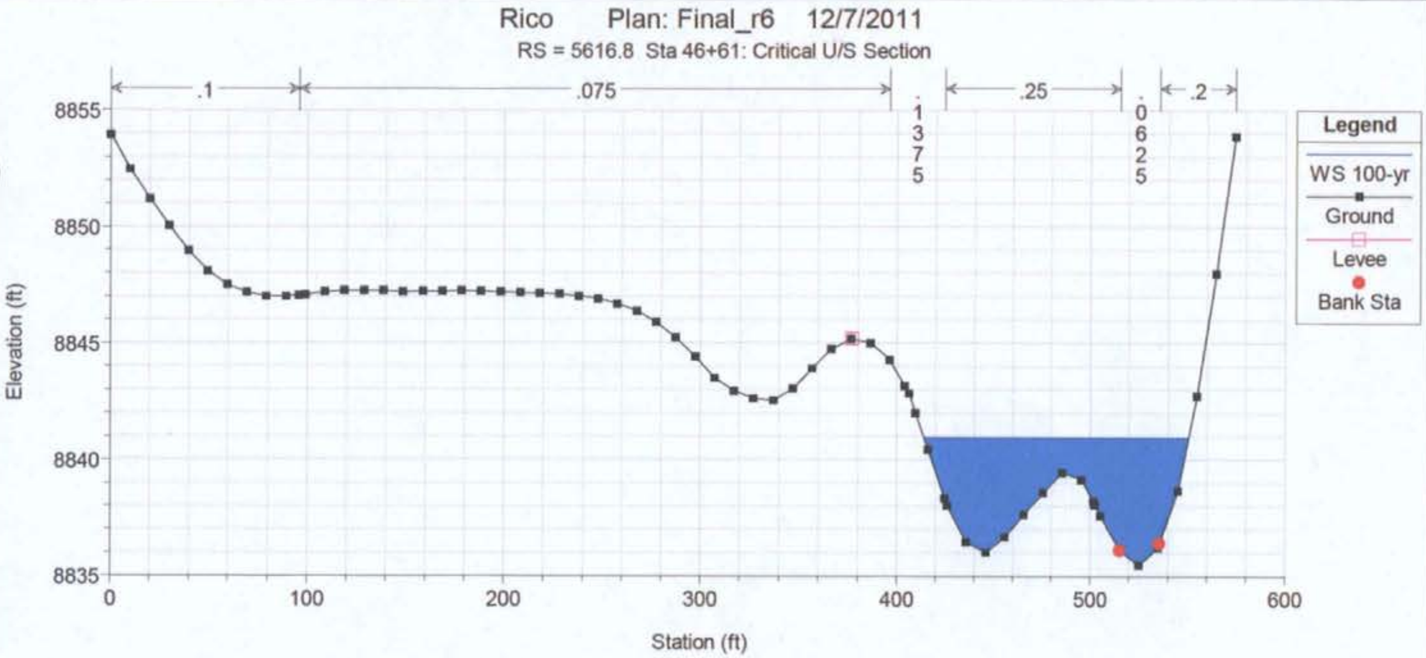

Rico Plan: Final_r6 12/7/2011
RS = 6060.6 Sta 51+05


Rico Plan: Final_r6 12/7/2011
RS = 5986.1 Sta 50+30

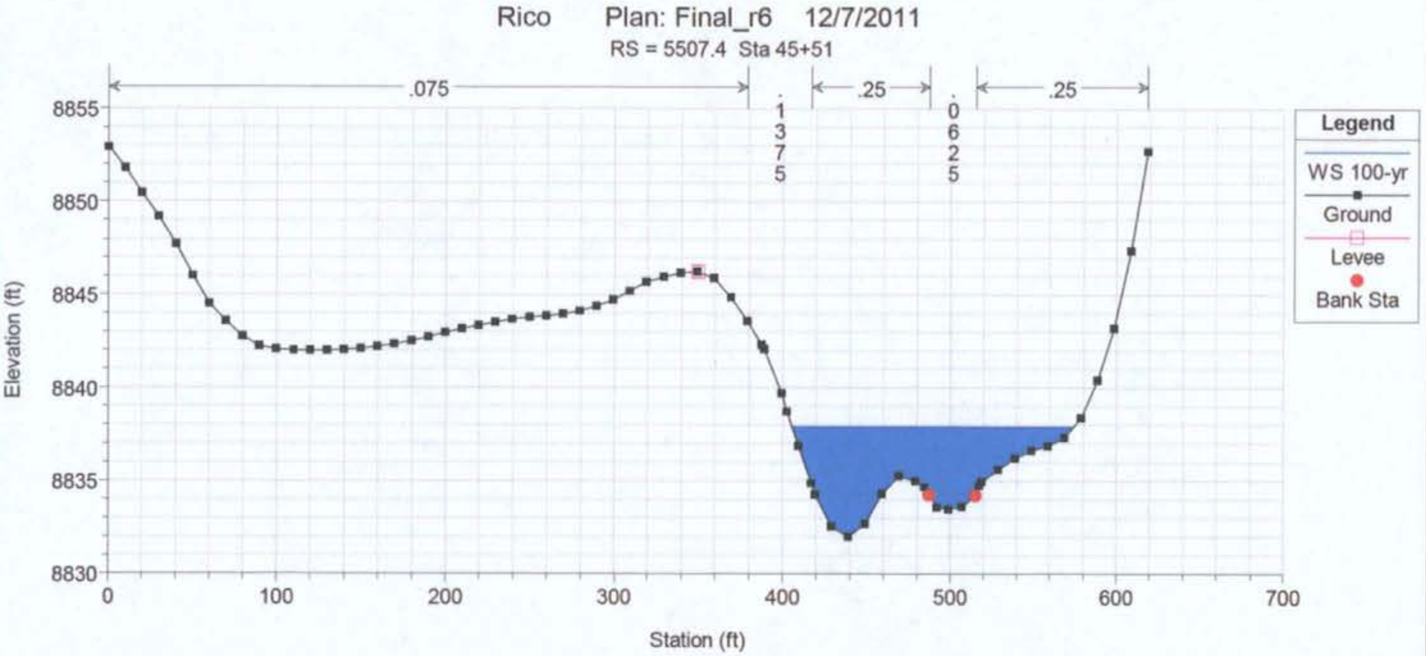

Rico Plan: Final_r6 12/7/2011
RS = 5886.8 Sta 49+30
.1
.25
.0625
.1
Legend
WS 100-yr
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
8840
8845
8850
8855
8860
8865
Station (ft)
0
100
200
300
400
500


Rico Plan: Final_r6 12/7/2011
RS = 5791.8 Sta 48+36
.1
.25
.0625
.1
Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
8835
8840
8845
8850
8855
8860
Station (ft)
0
100
200
300
400
500

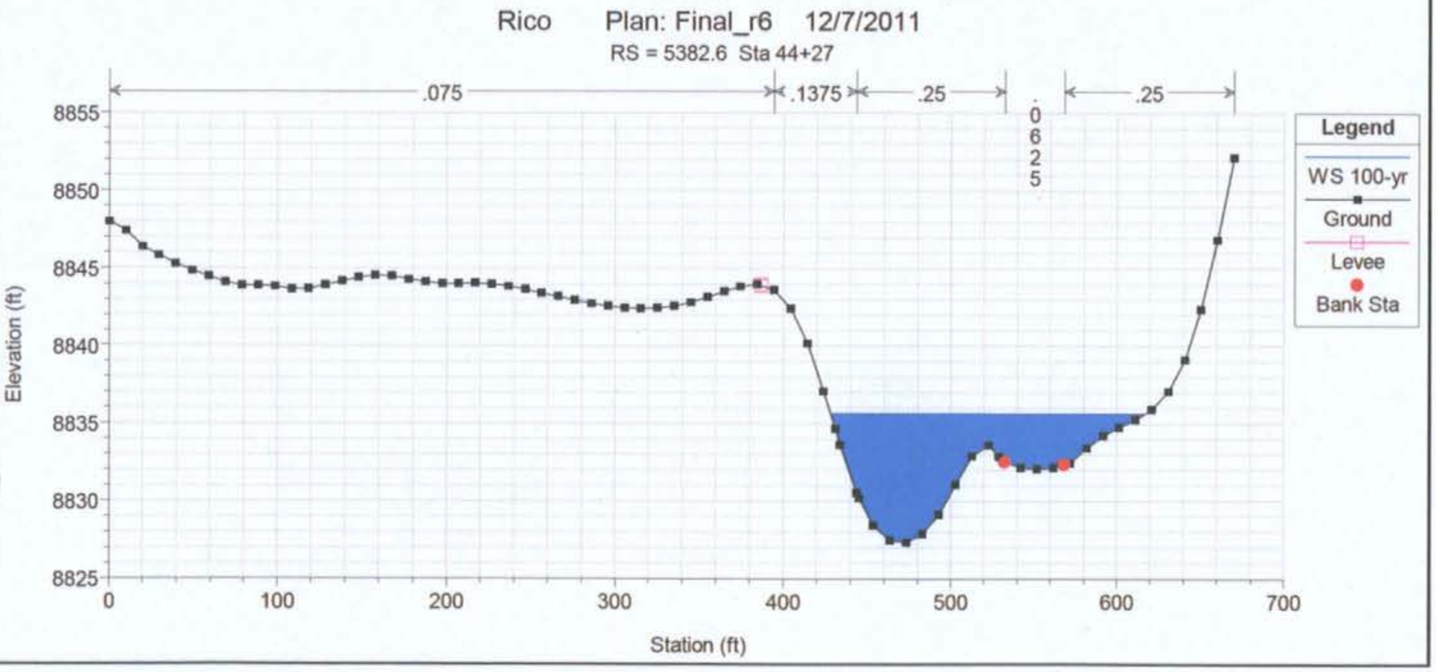

Rico Plan: Final_r6 12/7/2011
RS = 5706.7 Sta 47+51
.1
.075
.1188
.1375
.25
.0625
.1
Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
8835
8840
8845
8850
8855
8860
Station (ft)
0
100
200
300
400
500
600


Rico Plan: Final_r6 12/7/2011

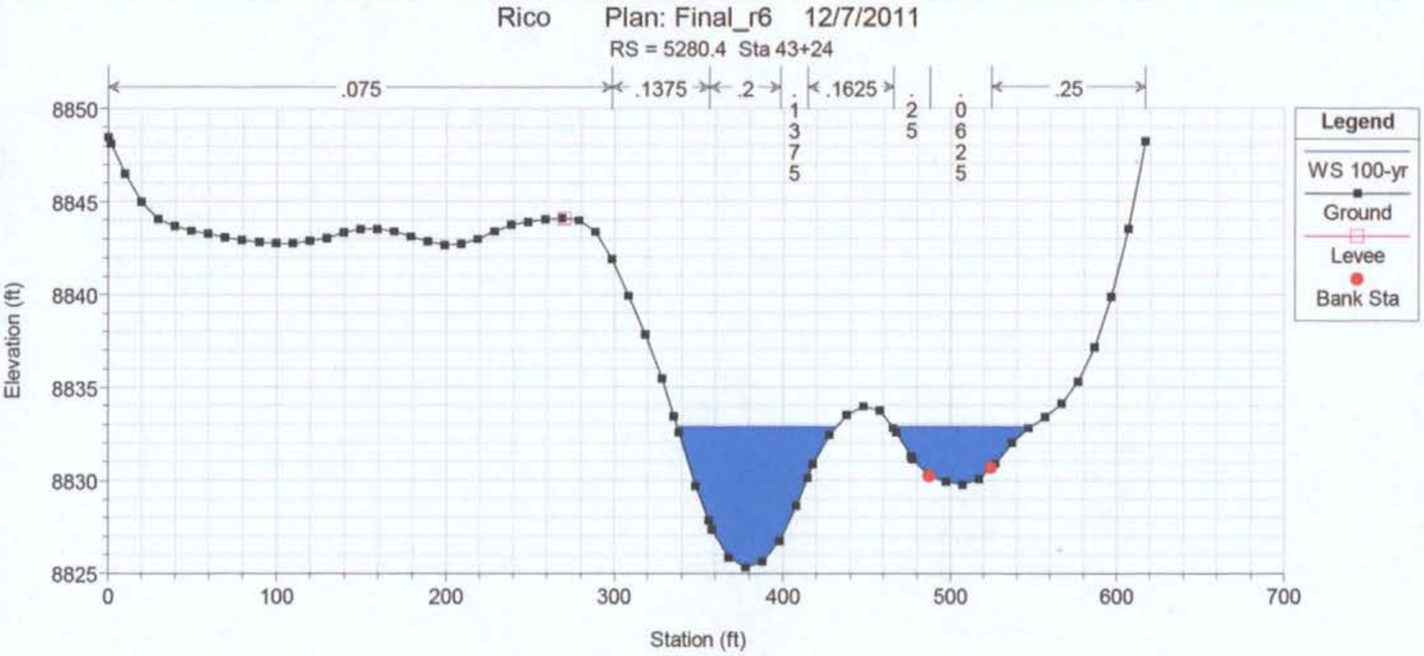
RS = 5616.8 Sta 46+61: Critical U/S Section


Rico Plan: Final_r6 12/7/2011

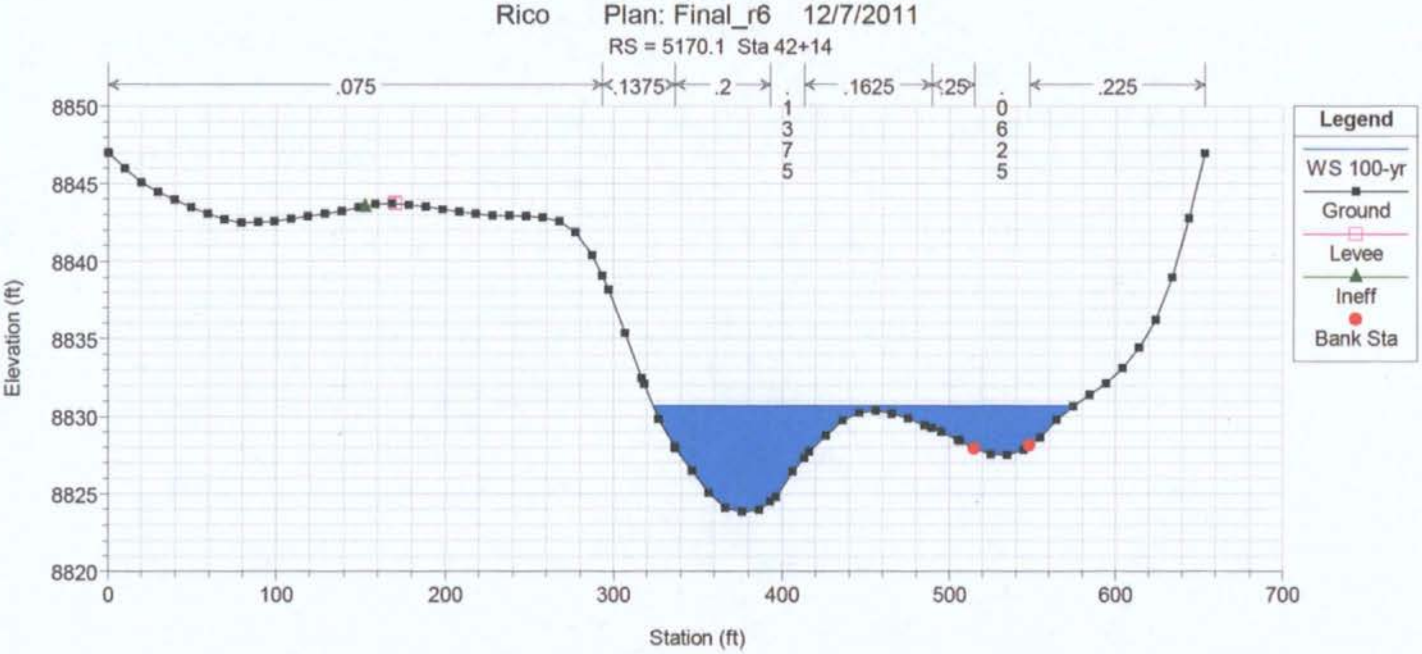
RS = 5507.4 Sta 45+51


Rico Plan: Final_r6 12/7/2011

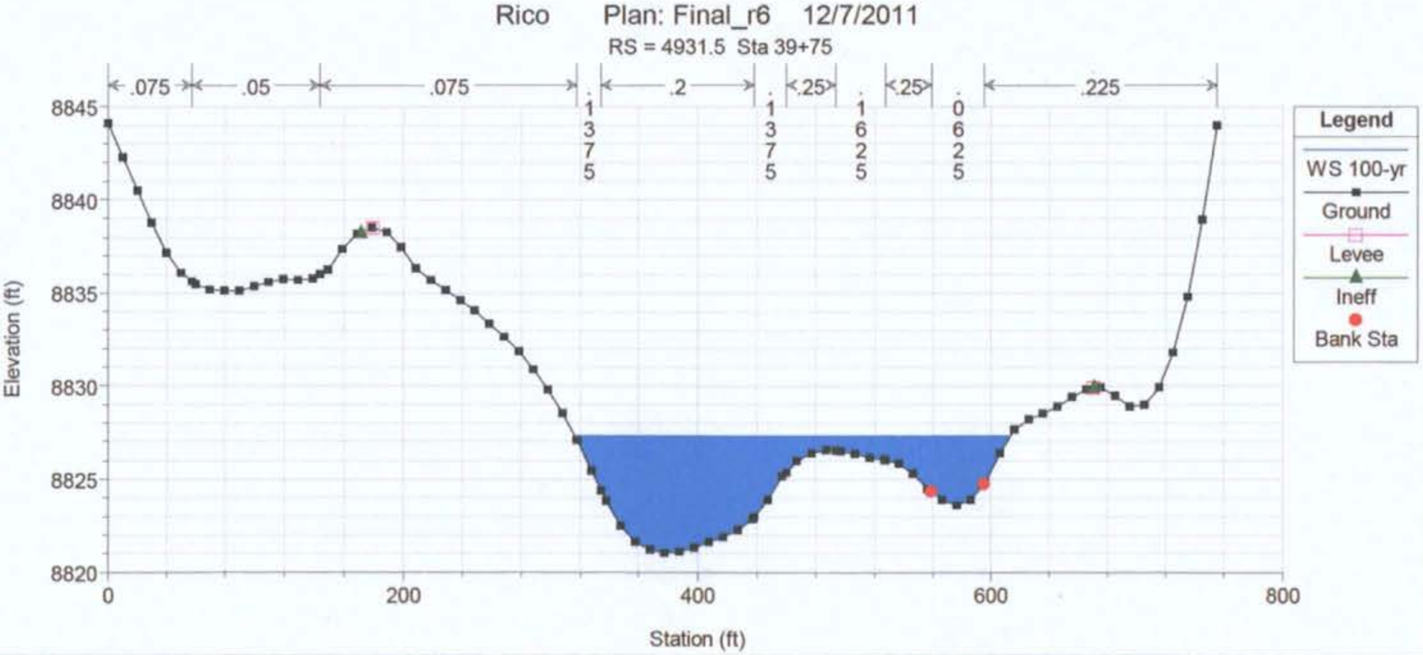
RS = 5382.6 Sta 44+27


Rico Plan: Final_r6 12/7/2011

RS = 5280.4 Sta 43+24


Rico Plan: Final_r6 12/7/2011

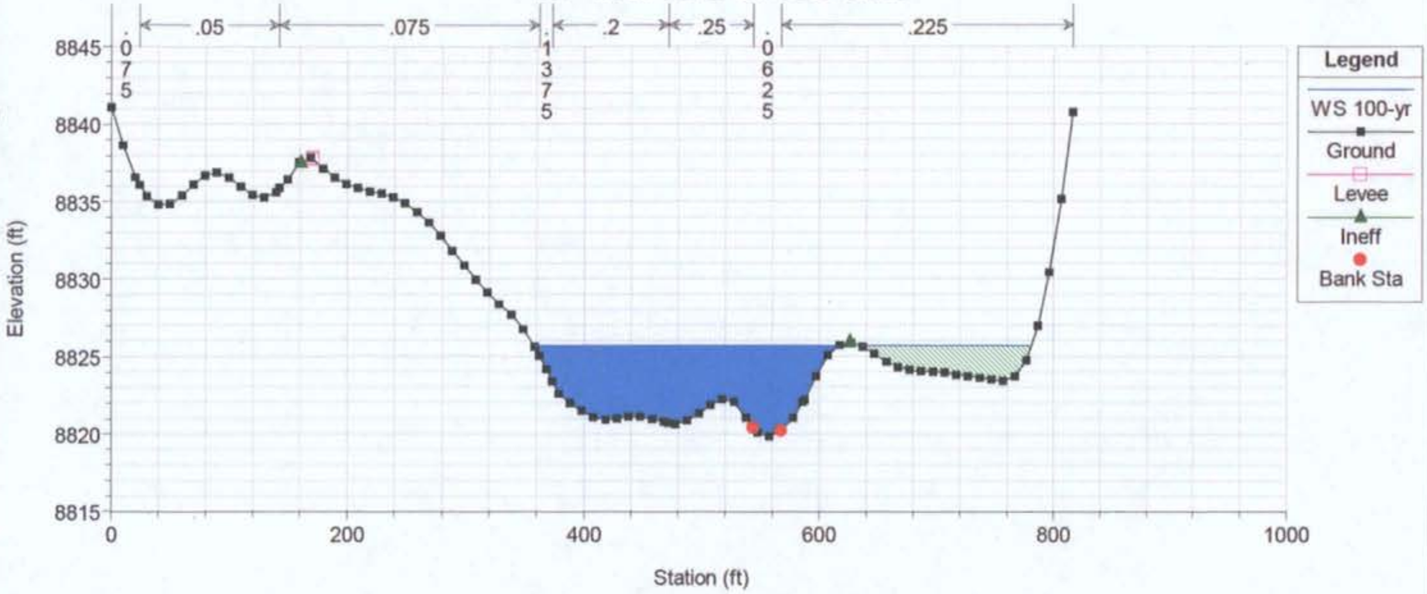
RS = 5170.1 Sta 42+14


Rico Plan: Final_r6 12/7/2011

RS = 4931.5 Sta 39+75

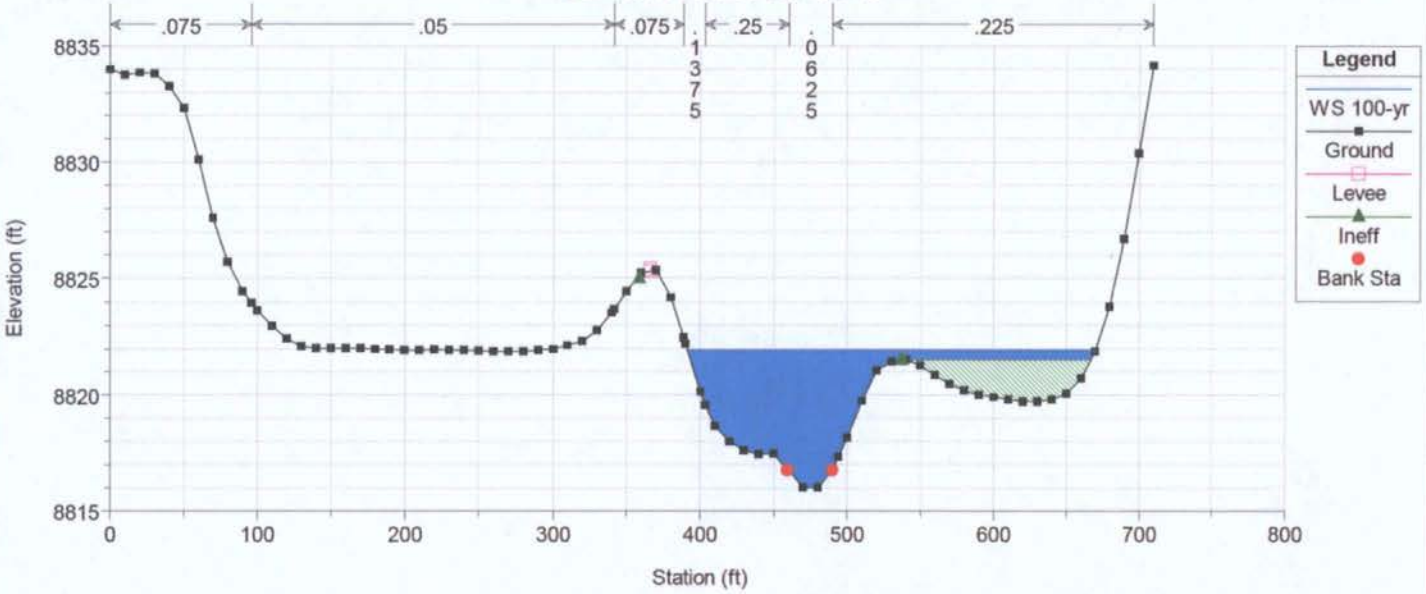
Rico Plan: Final_r6 12/7/2011

RS = 4781.7 Sta 38+26: U/S of Pond 18



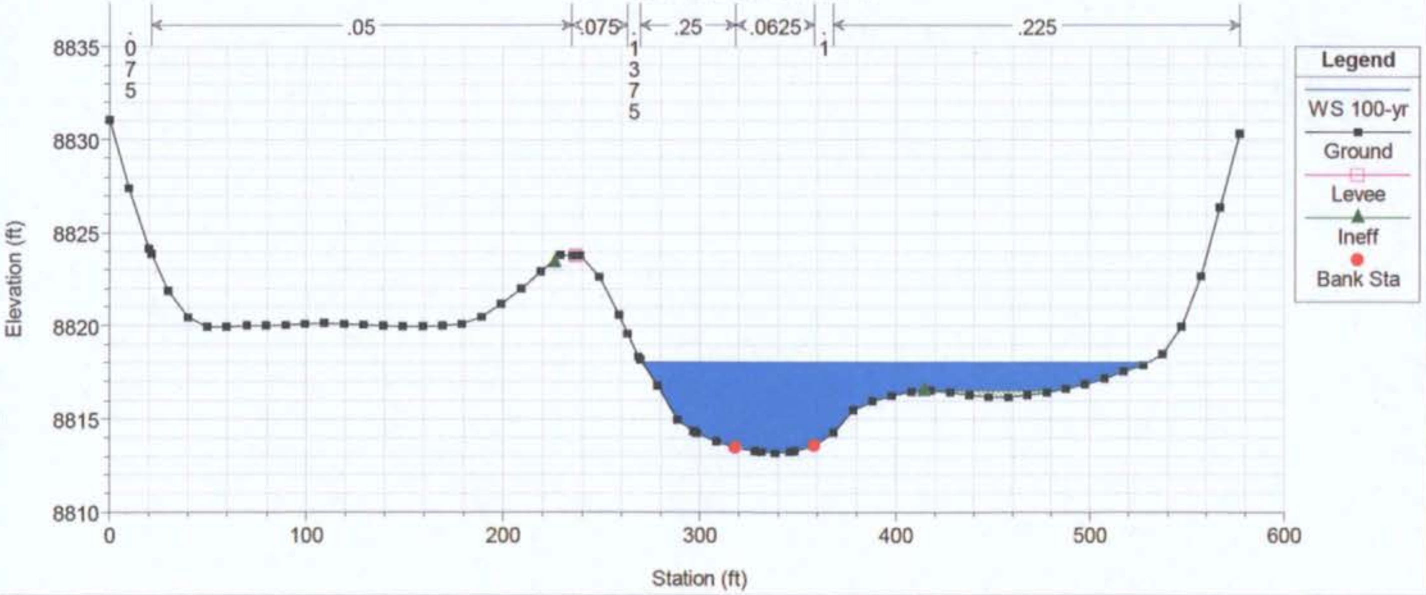
Rico Plan: Final_r6 12/7/2011

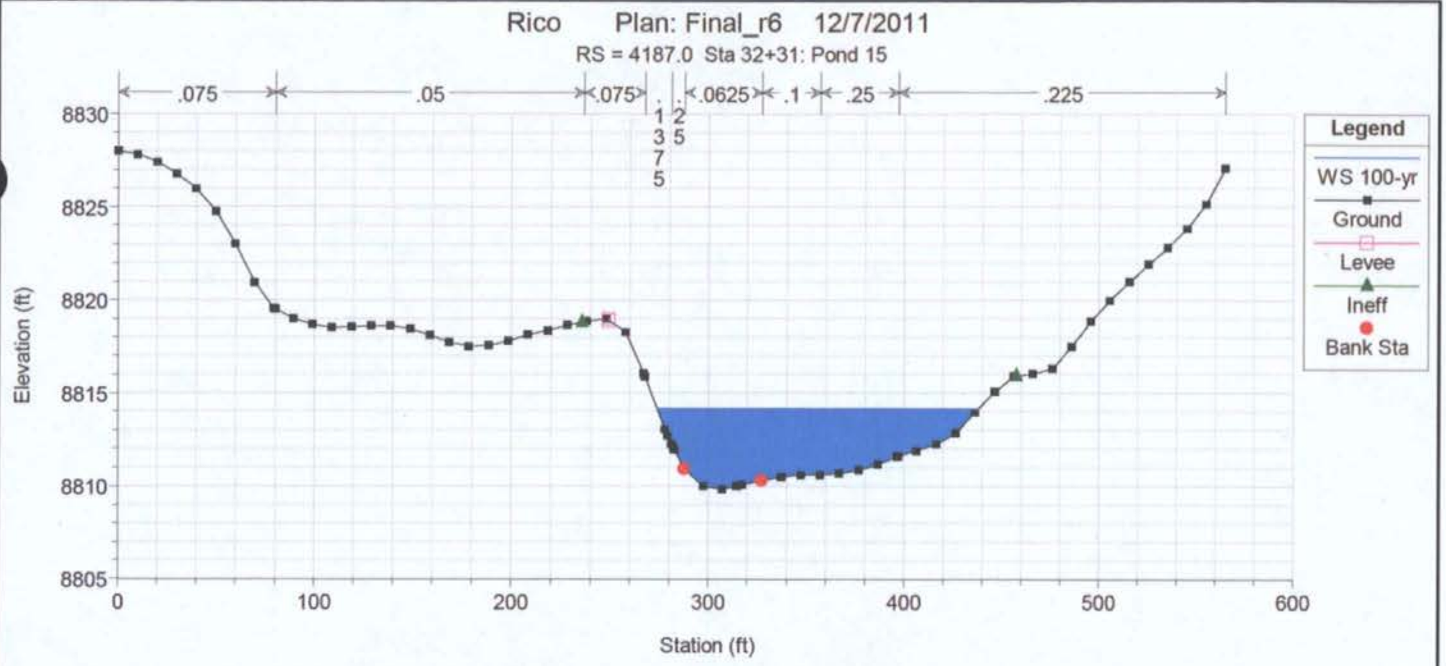
RS = 4577.4 Sta 36+21: Pond 18



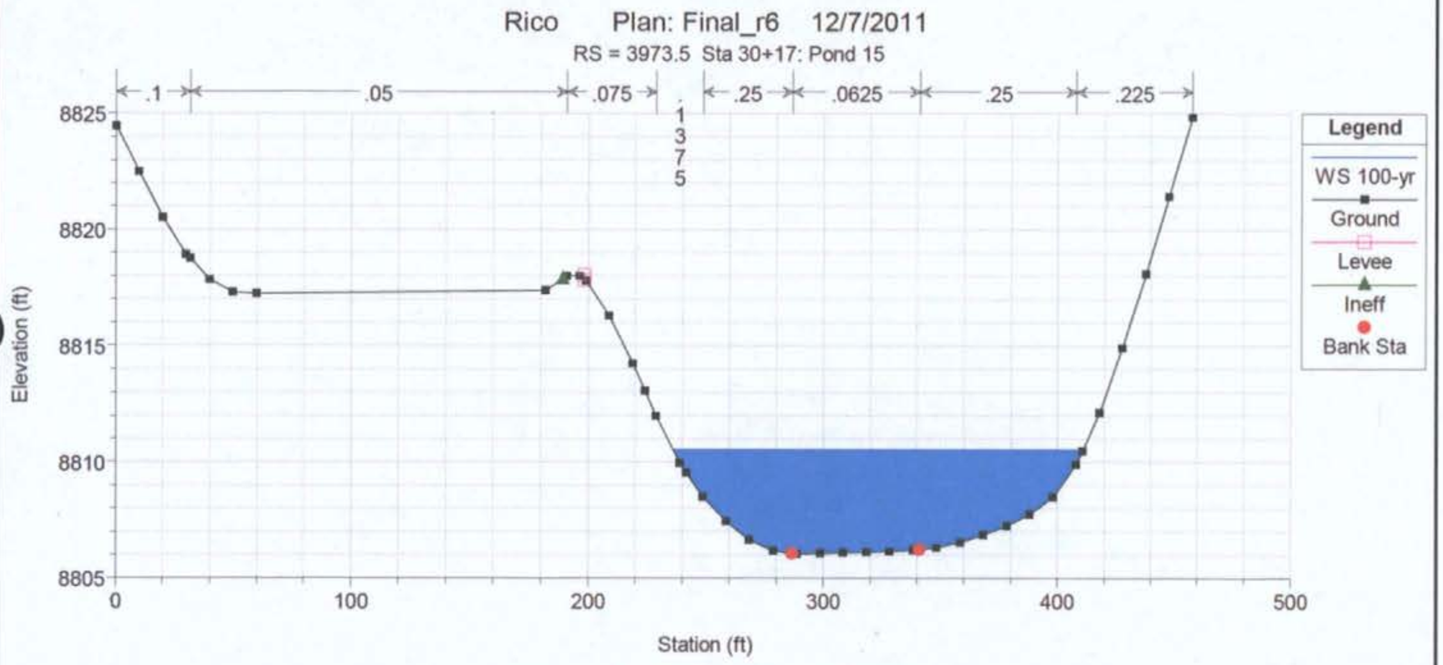
Rico Plan: Final_r6 12/7/2011

RS = 4404.1 Sta 34+48: Pond 18

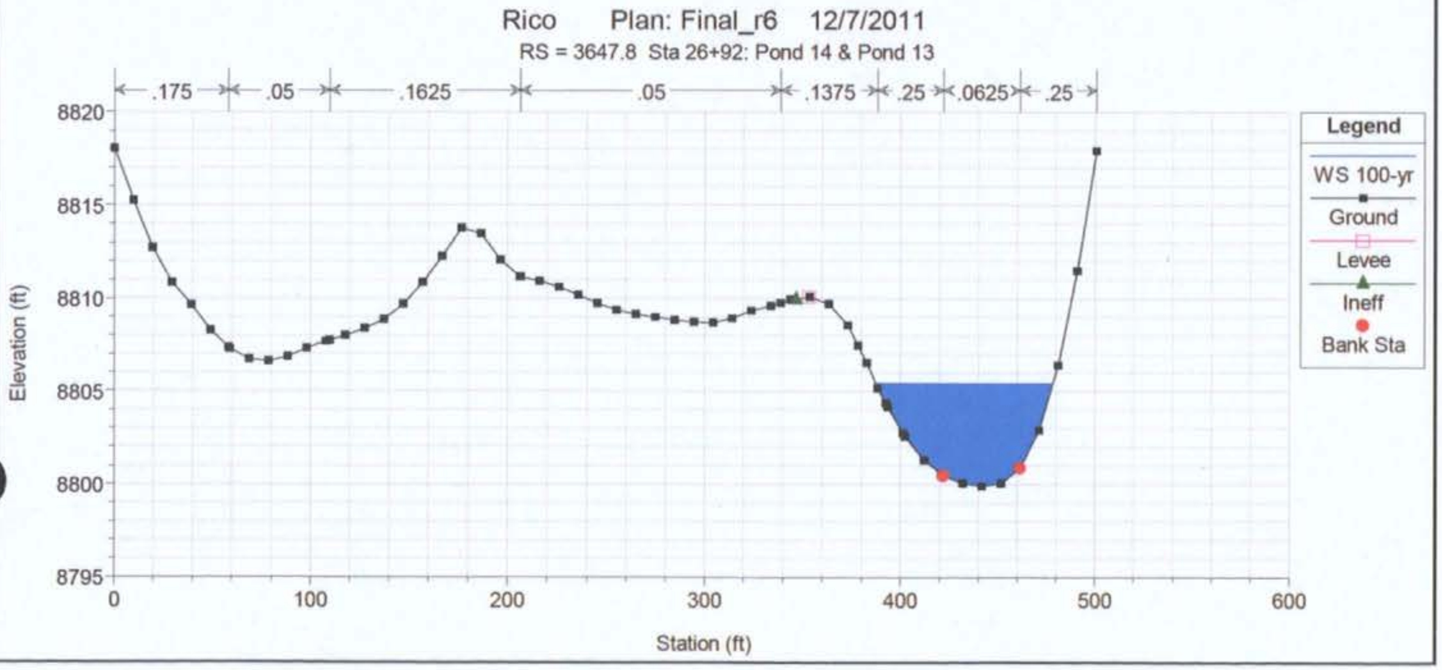



Rico Plan: Final_r6 12/7/2011

RS = 4187.0 Sta 32+31: Pond 15


Rico Plan: Final_r6 12/7/2011

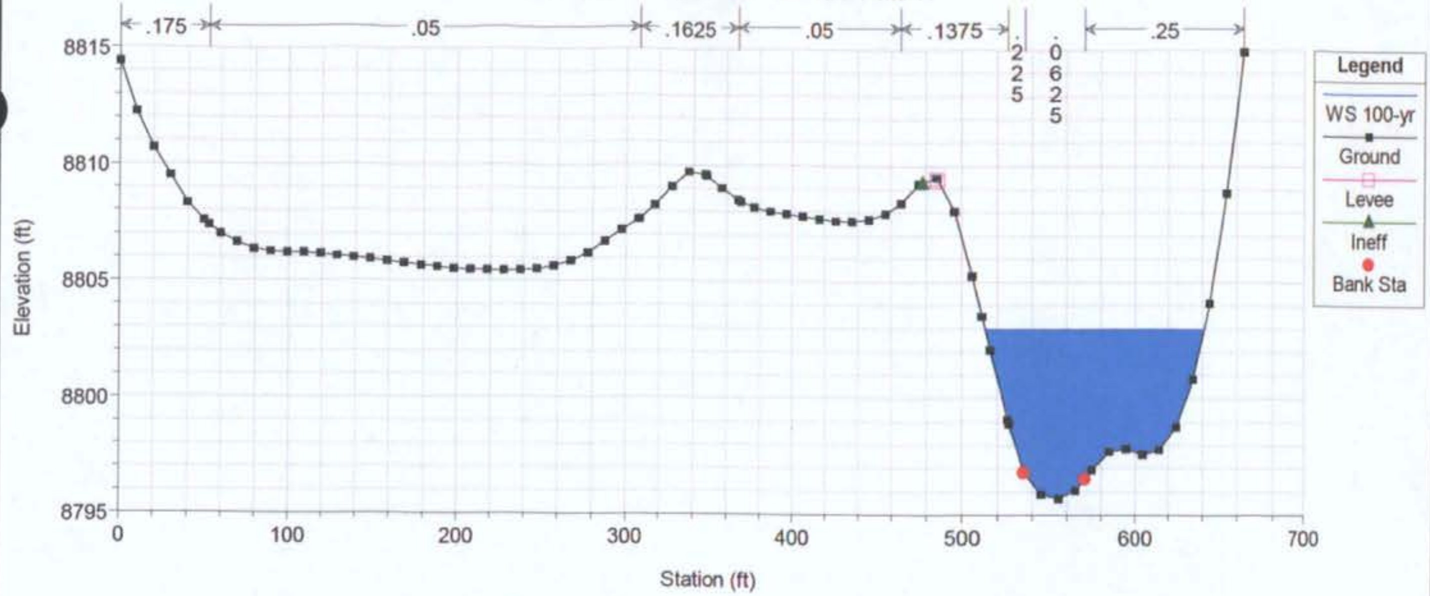
RS = 3973.5 Sta 30+17: Pond 15


Rico Plan: Final_r6 12/7/2011

RS = 3647.8 Sta 26+92: Pond 14 & Pond 13

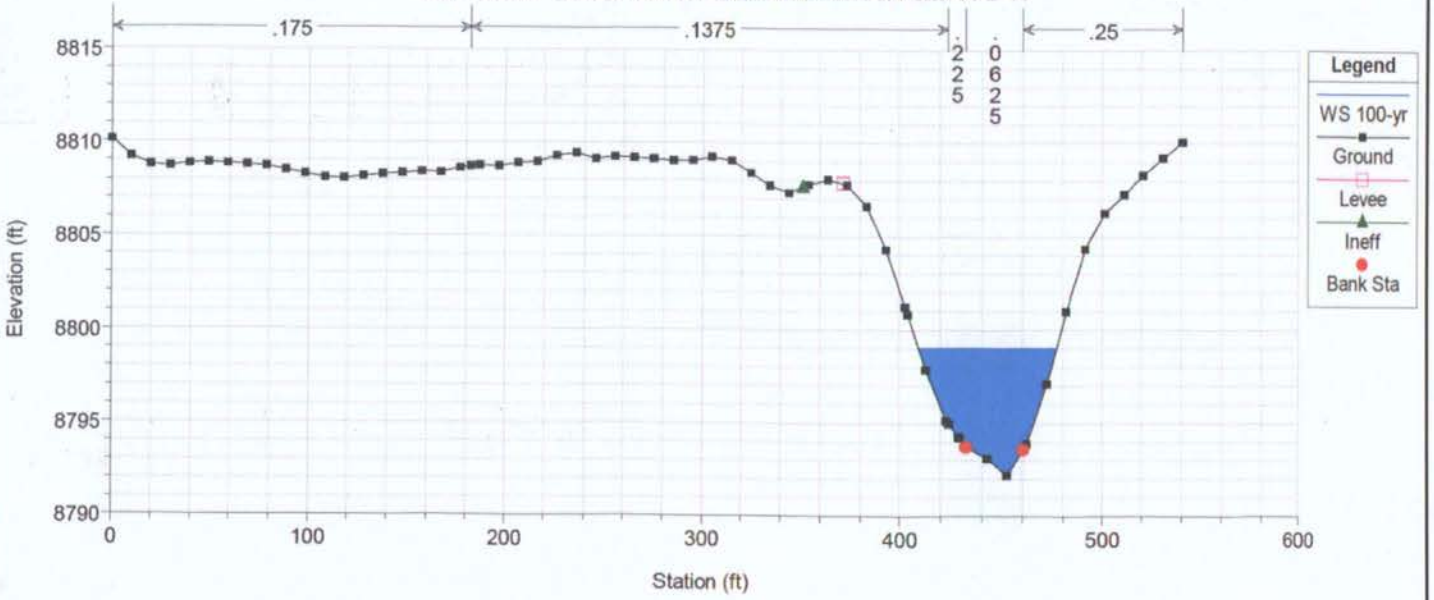
Rico Plan: Final_r6 12/7/2011

RS = 3420.7 Sta 24+65: Pond 12 & Pond 13



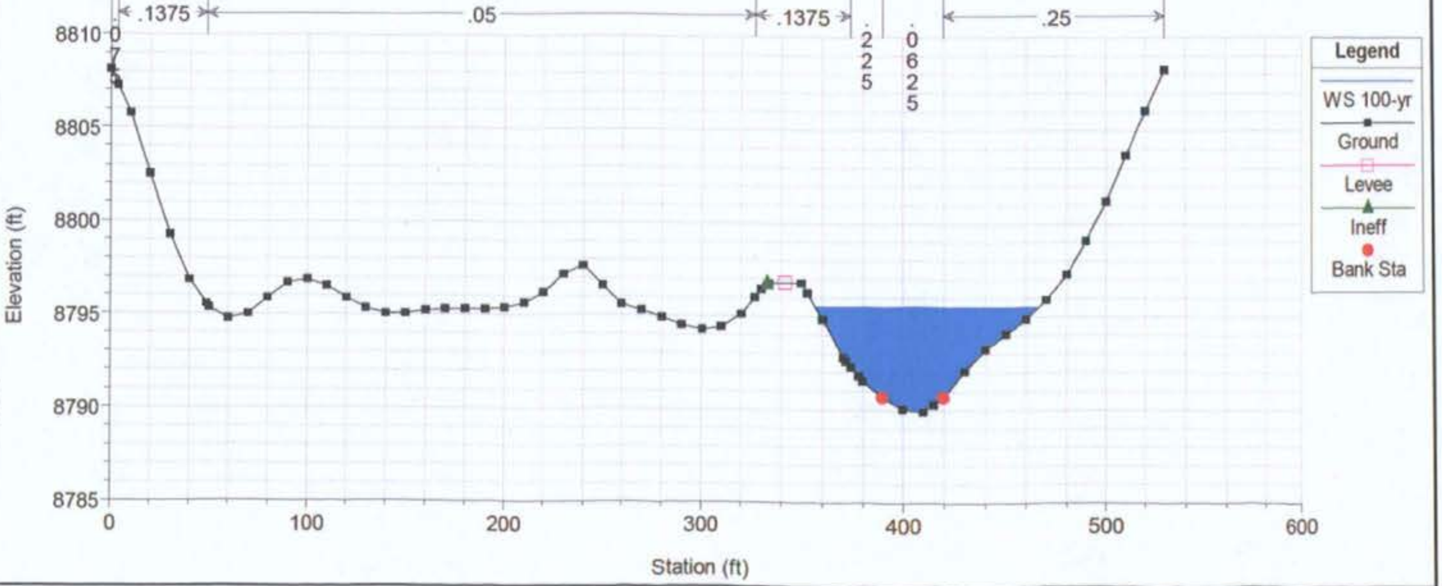
Rico Plan: Final_r6 12/7/2011

RS = 3169.1 Sta 22+13: Dike across south side of Pond 11 & 13



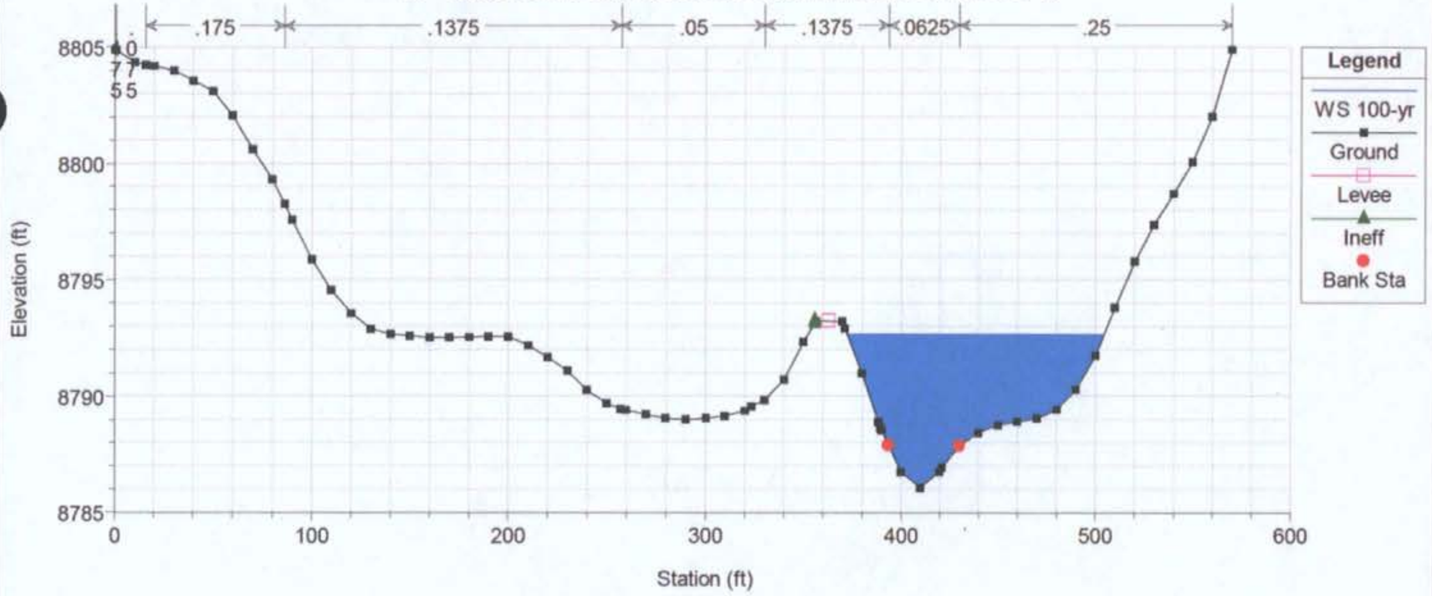
Rico Plan: Final_r6 12/7/2011

RS = 3000.9 Sta 20+45: Pond 9 & Pond 10



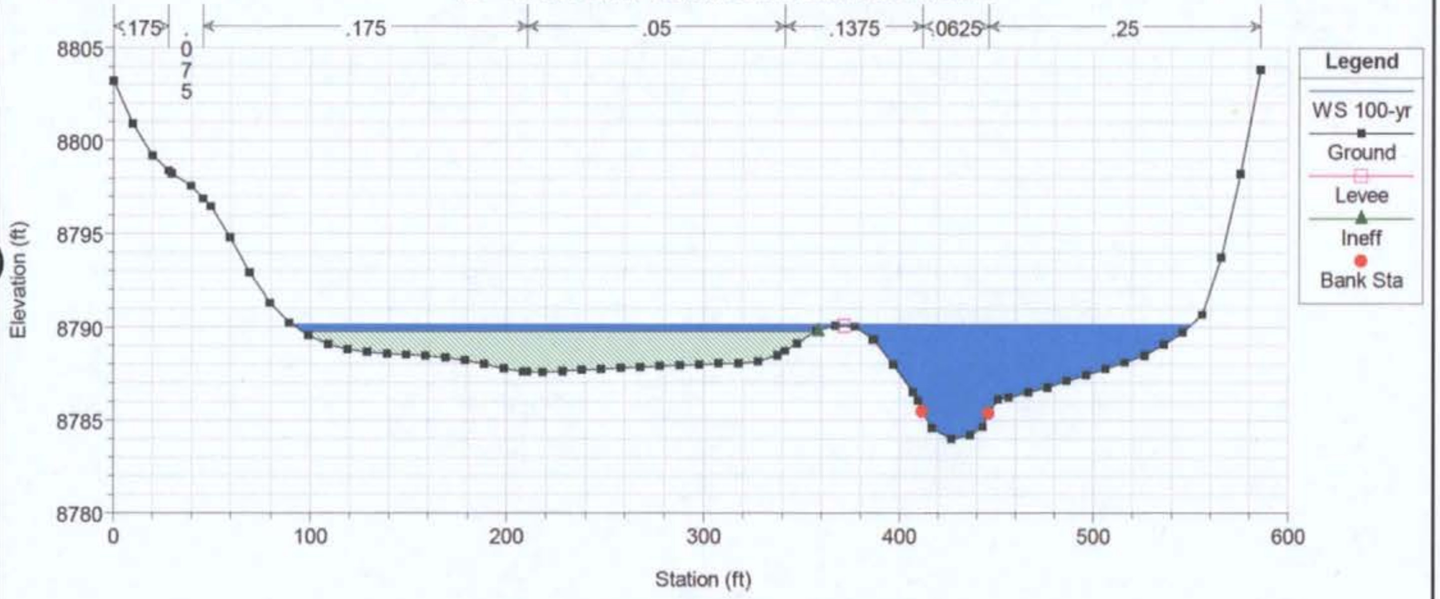
Rico Plan: Final_r6 12/7/2011

RS = 2855.1 Sta 18+99: Pond 8, Dike across south side of Pond 9 & 10



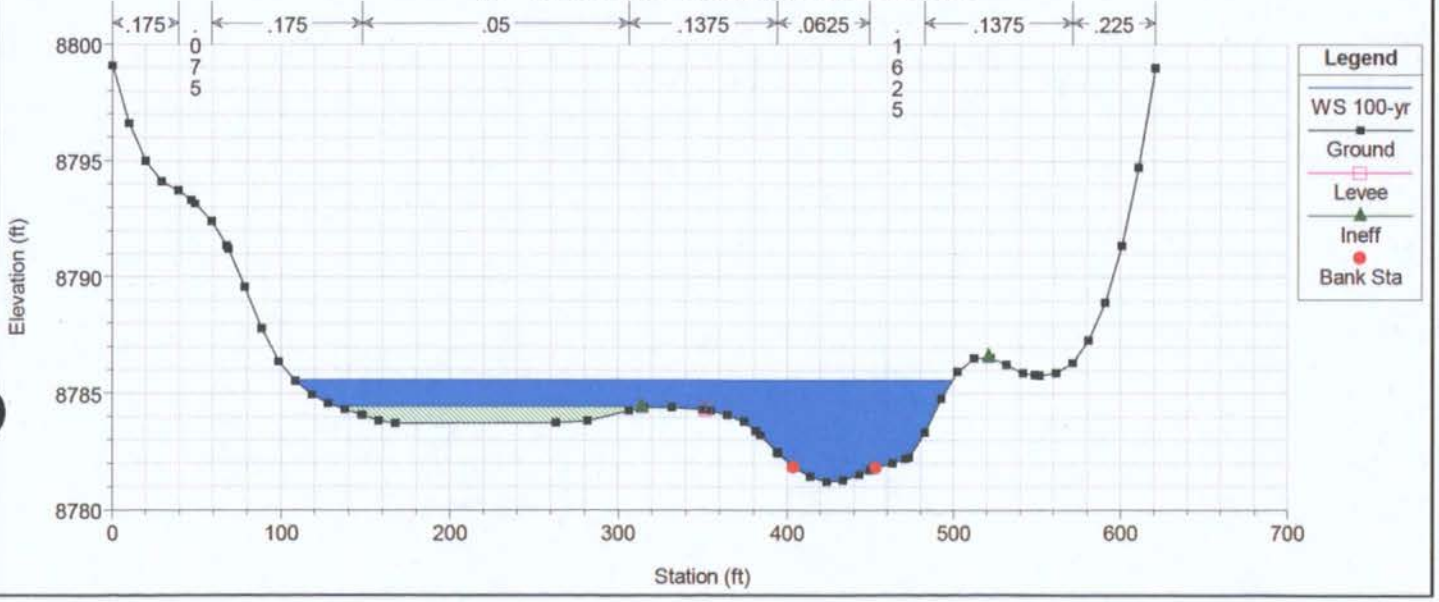
Rico Plan: Final_r6 12/7/2011

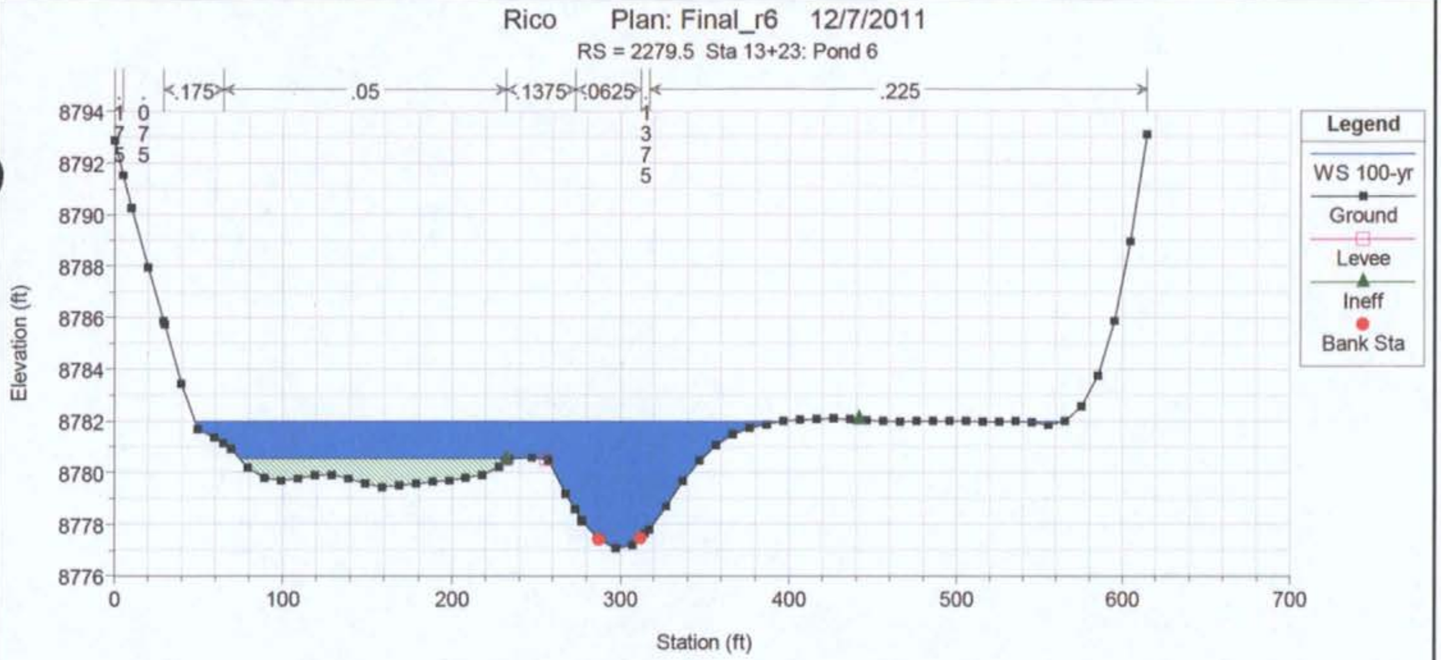
RS = 2712.3 Sta 17+56: Dike across south side of Pond 8



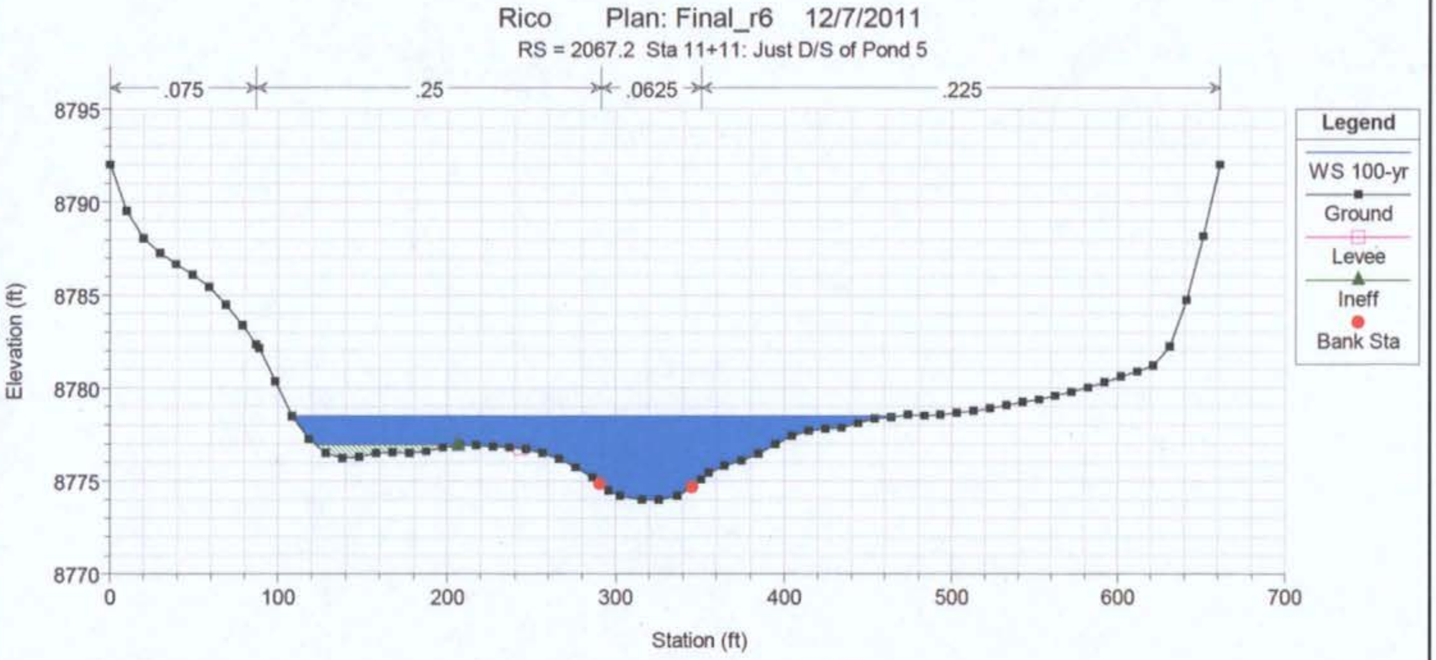
Rico Plan: Final_r6 12/7/2011

RS = 2468.5 Sta 15+12: Pond 7 just upstream of dike

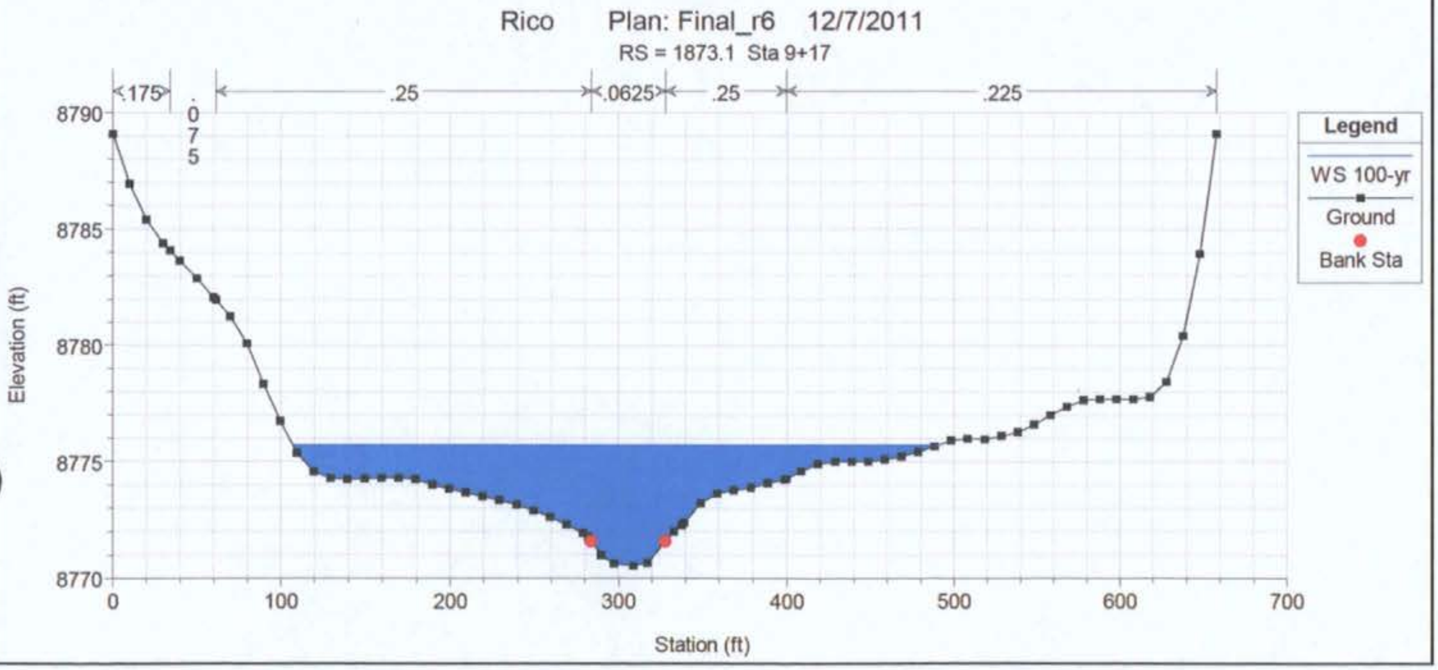



Rico Plan: Final_r6 12/7/2011

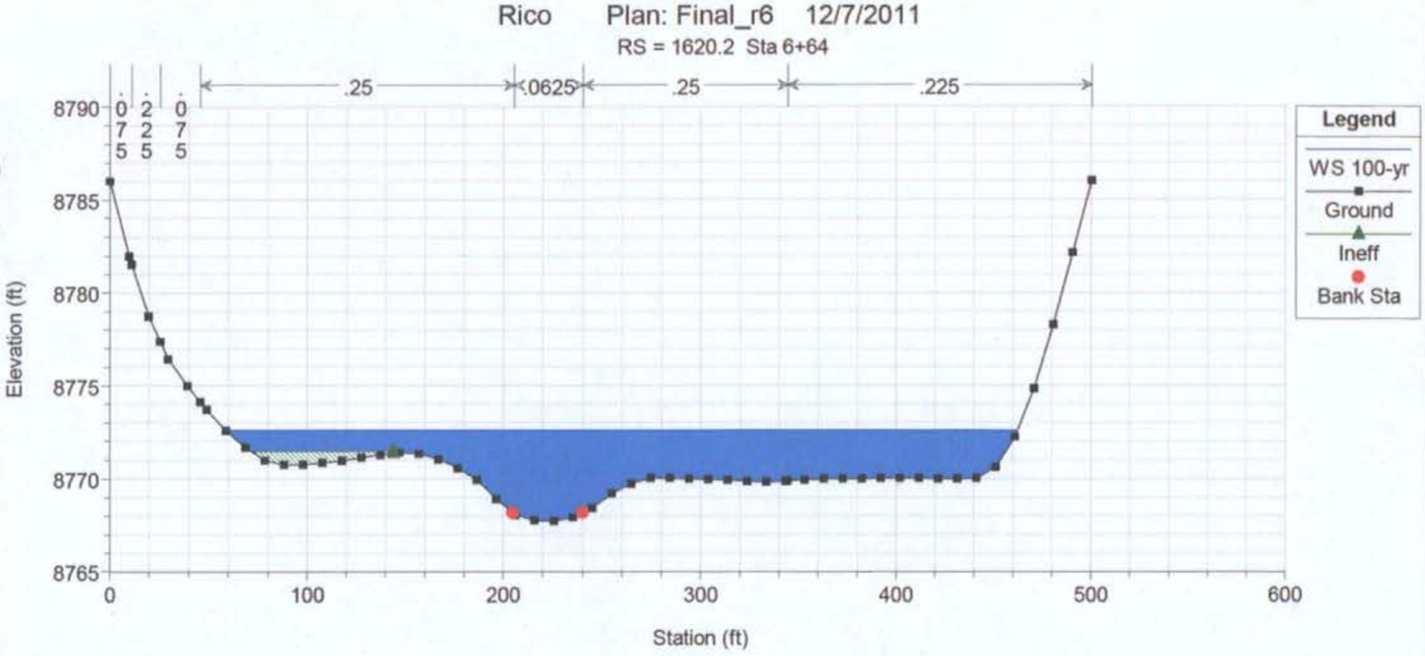
RS = 2279.5 Sta 13+23: Pond 6

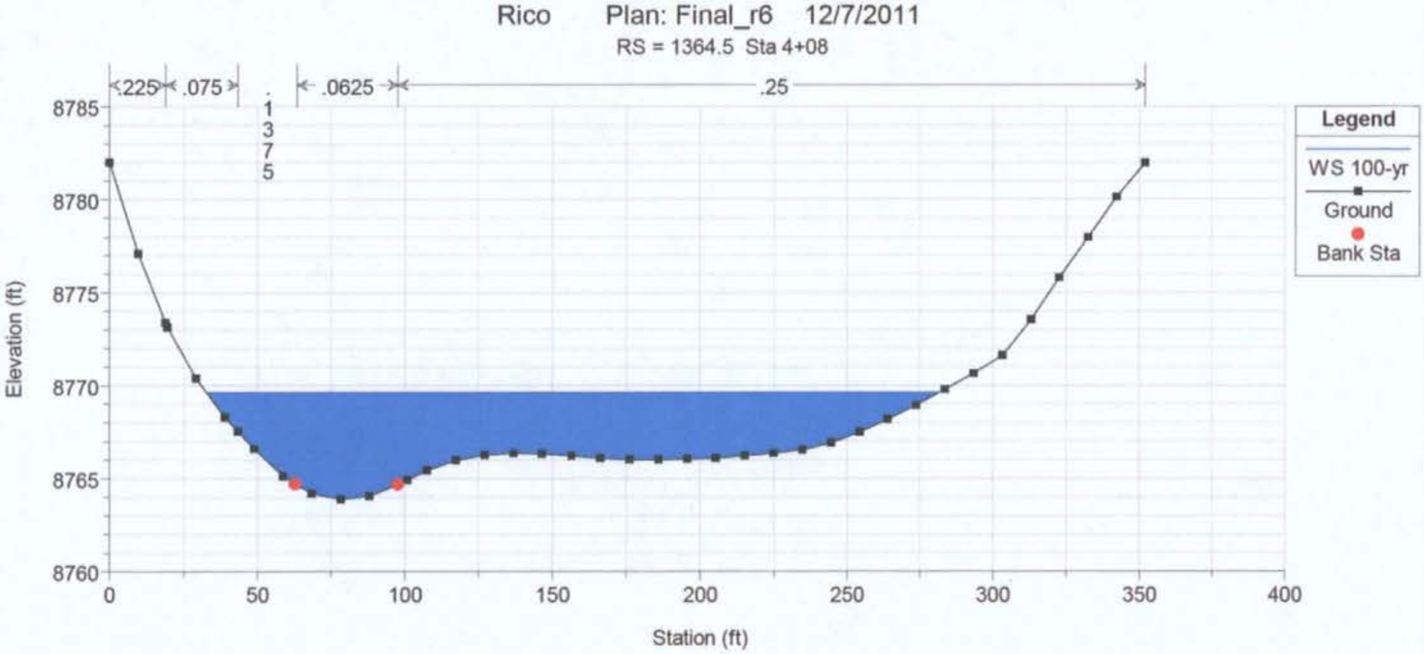

Rico Plan: Final_r6 12/7/2011

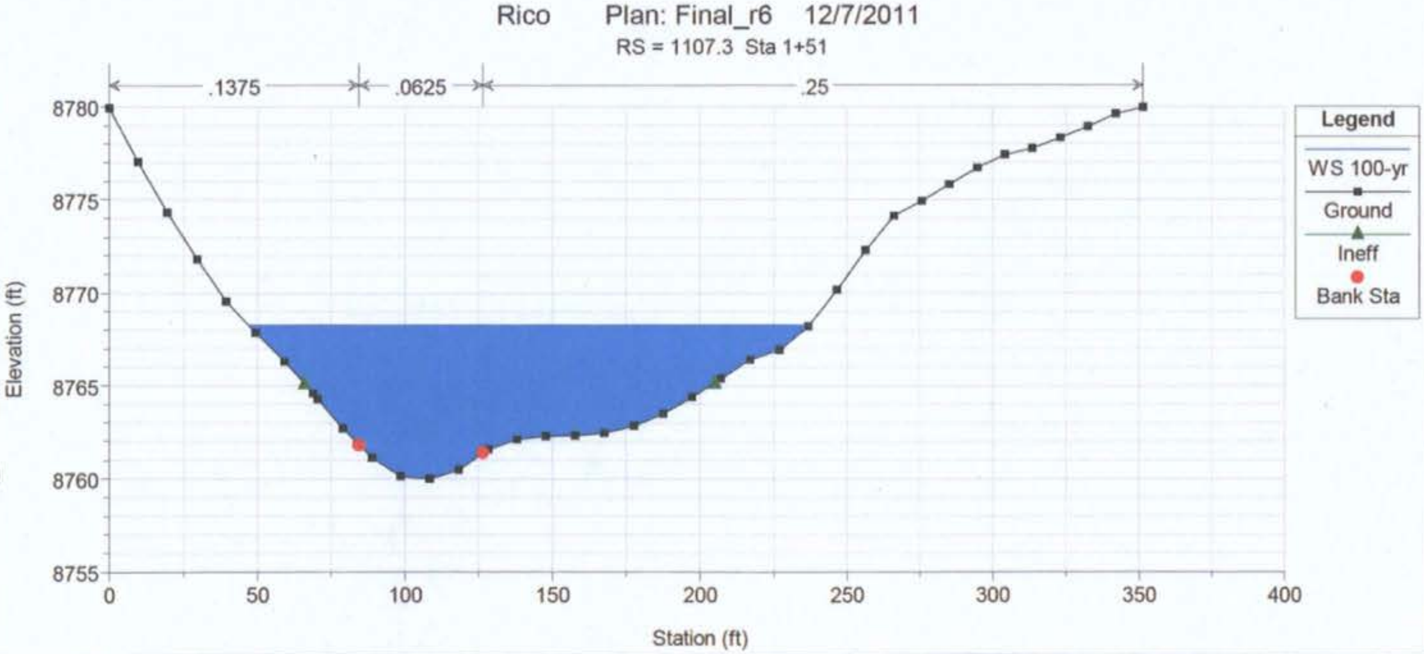
RS = 2067.2 Sta 11+11: Just D/S of Pond 5


Rico Plan: Final_r6 12/7/2011

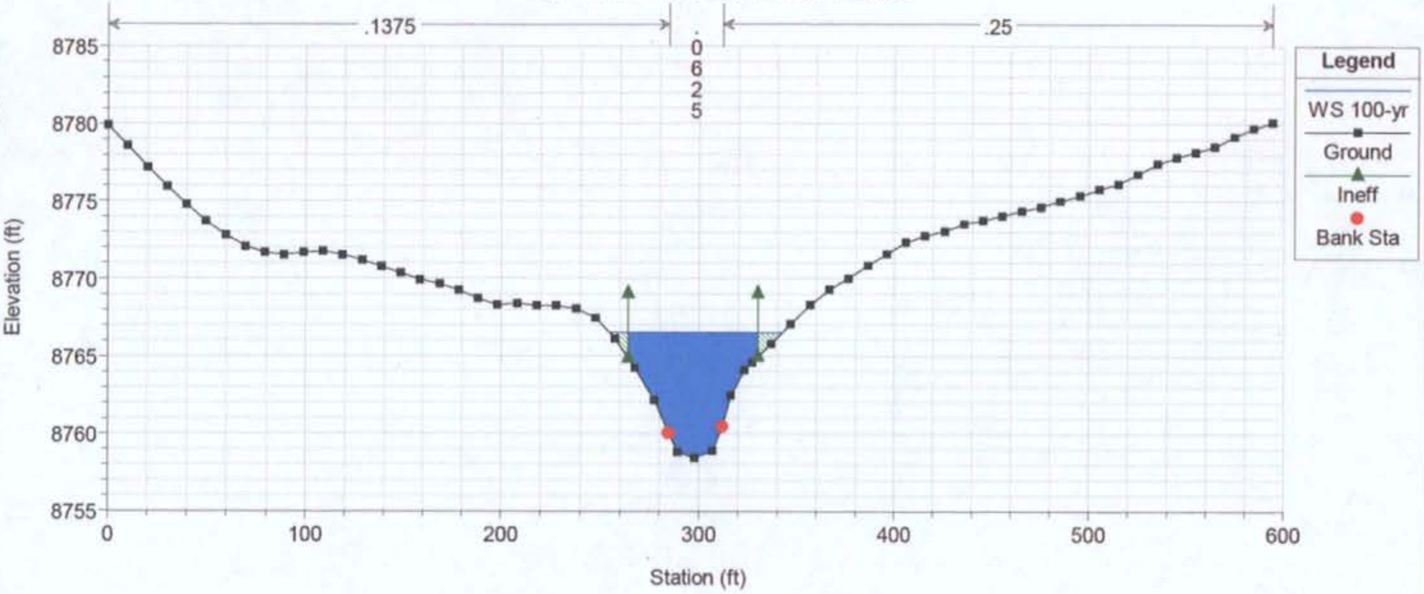
RS = 1873.1 Sta 9+17


Rico Plan: Final_r6 12/7/2011
RS = 1620.2 Sta 6+64

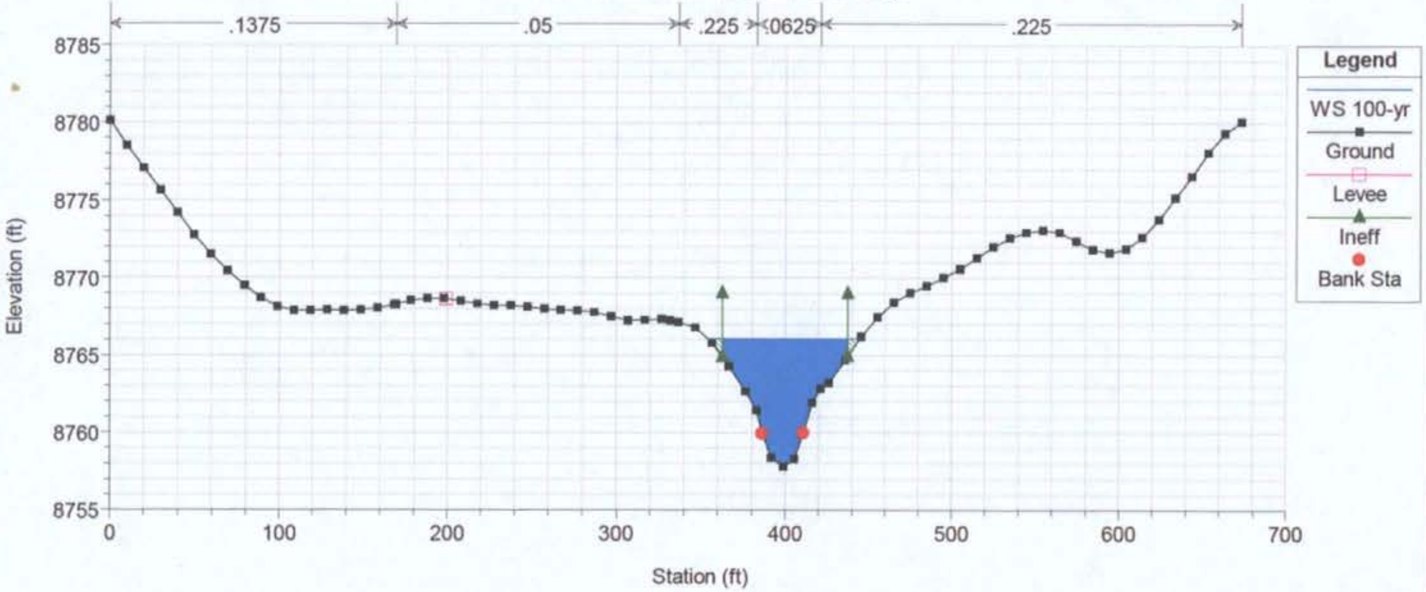

Rico Plan: Final_r6 12/7/2011
RS = 1364.5 Sta 4+08


Rico Plan: Final_r6 12/7/2011
RS = 1107.3 Sta 1+51

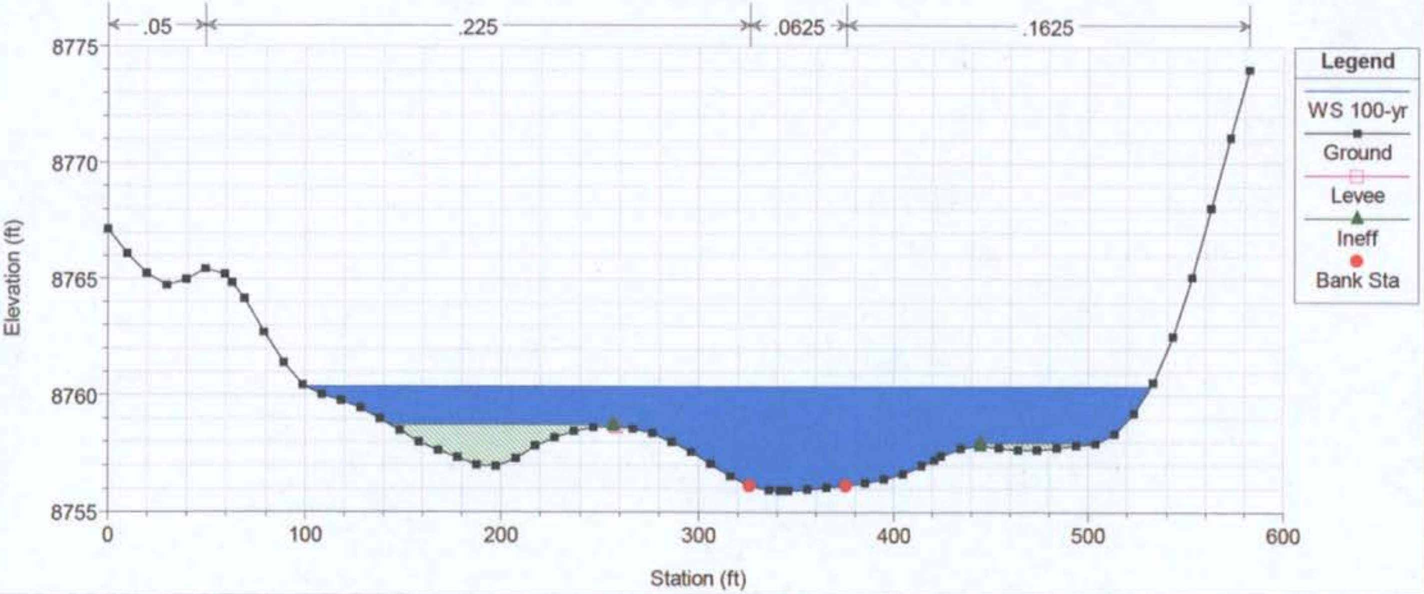
Rico Plan: Final_r6 12/7/2011
RS = 968.3 Sta 0+12: U/S face of bridge



Rico Plan: Final_r6 12/7/2011
RS = 909.8 Sta 0-46: D/S face of bridge

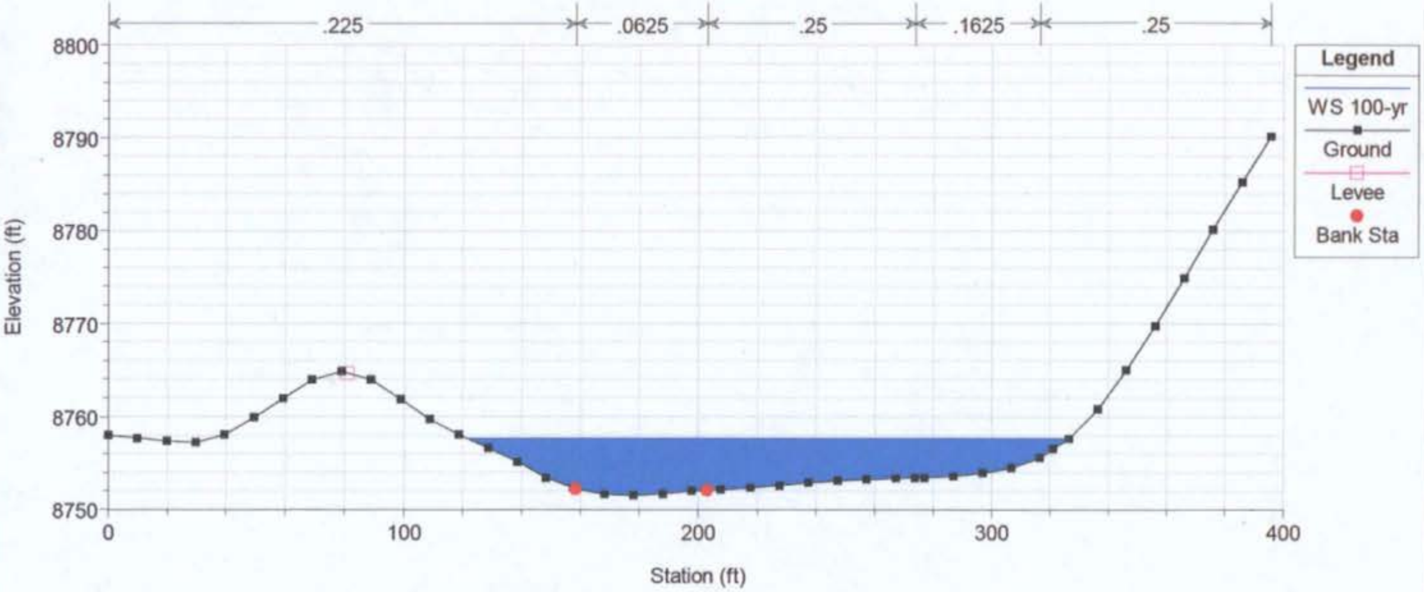


Rico Plan: Final_r6 12/7/2011
RS = 699.2



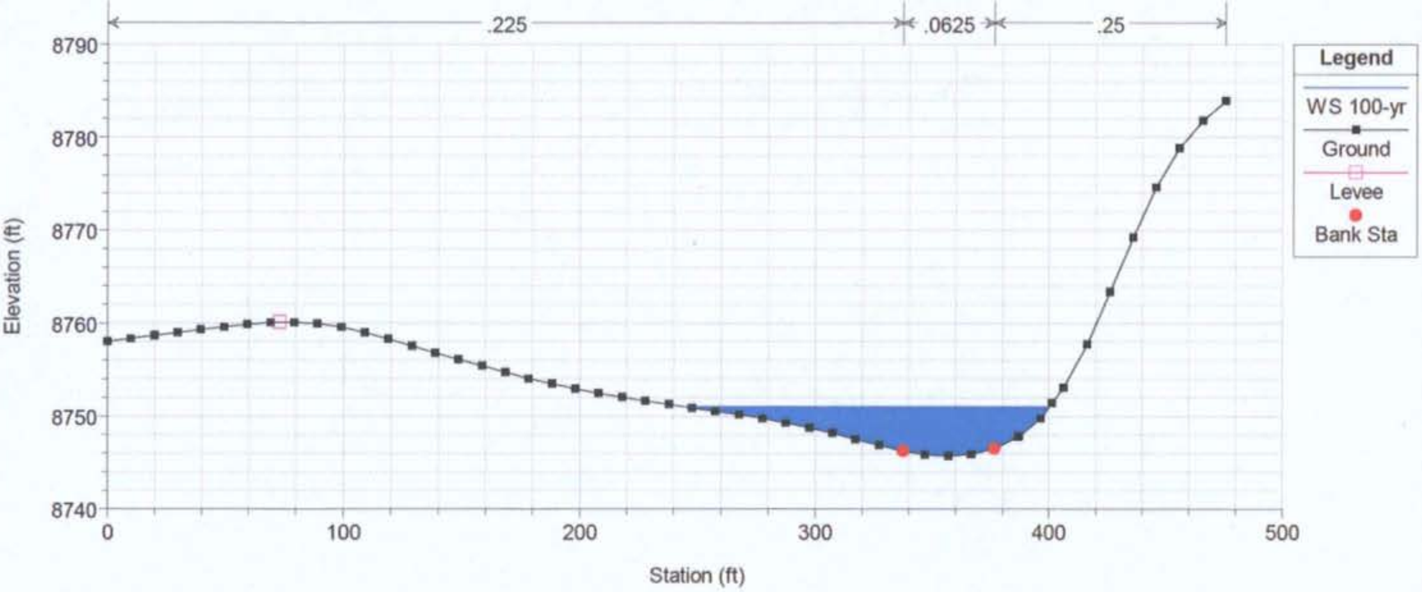
Rico Plan: Final_r6 12/7/2011

RS = 391.7



Rico Plan: Final_r6 12/7/2011

RS = 41.2



| | | | | | |
|---|---|---|---|---|---|
| Plan | Final_r5 | Profile | 10-year | 25-year | 50-year |
| | | Flow | 1275 cfs | 1630 cfs | 1900 cfs |

| Profile | River Sta | RAS River Sta | Slope Invert | Min Ch El (ft) | W.S. El (ft) | Max Chl Dpth (ft) | Crit W.S. (ft) | E.G. Elev (ft) | Vel Chnl (ft/s) | Vel Total (ft/s) | Top Width (ft) | Mann Wtd Left | Mann Wtd Chnl | Mann Wtd Rght | Froude # Chnl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-yr | 54+44.5 | 6400.6 | 0.0081 | 8849.9 | 8854.3 | 4.4 | 8853.6 | 8855.2 | 7.91 | 5.82 | 87.2 | 0.200 | 0.050 | 0.140 | 0.70 |
| 25-yr | | 6400.6 | 0.0081 | 8849.9 | 8854.8 | 4.9 | 8854.1 | 8855.9 | 8.80 | 6.13 | 98.0 | 0.200 | 0.050 | 0.140 | 0.74 |
| 50-yr | | 6400.6 | 0.0081 | 8849.9 | 8855.2 | 5.3 | 8854.6 | 8856.4 | 9.32 | 6.28 | 102.1 | 0.200 | 0.050 | 0.140 | 0.75 |
| 10-yr | 53+51.9 | 6308.0 | 0.0171 | 8849.1 | 8852.6 | 3.5 | 8852.6 | 8853.8 | 9.88 | 5.70 | 98.8 | 0.200 | 0.051 | 0.139 | 0.96 |
| 25-yr | | 6308.0 | 0.0171 | 8849.1 | 8853.1 | 3.9 | 8853.0 | 8854.5 | 10.84 | 6.06 | 103.7 | 0.200 | 0.051 | 0.139 | 0.99 |
| 50-yr | | 6308.0 | 0.0171 | 8849.1 | 8853.4 | 4.2 | 8853.4 | 8855.0 | 11.44 | 6.28 | 107.0 | 0.200 | 0.051 | 0.139 | 1.00 |
| 10-yr | 52+72.5 | 6228.6 | 0.0215 | 8847.8 | 8851.3 | 3.6 | 8851.0 | 8852.2 | 7.87 | 4.94 | 118.0 | 0.200 | 0.050 | 0.200 | 0.77 |
| 25-yr | | 6228.6 | 0.0215 | 8847.8 | 8851.8 | 4.1 | 8851.4 | 8852.8 | 8.50 | 5.11 | 123.4 | 0.200 | 0.050 | 0.200 | 0.77 |
| 50-yr | | 6228.6 | 0.0215 | 8847.8 | 8852.2 | 4.4 | 8851.7 | 8853.3 | 8.92 | 5.22 | 126.9 | 0.200 | 0.050 | 0.200 | 0.78 |
| 10-yr | 51+94.5 | 6150.6 | 0.0216 | 8846.1 | 8850.1 | 4.0 | 8849.7 | 8851.0 | 7.86 | 5.55 | 104.5 | 0.200 | 0.050 | 0.200 | 0.75 |
| 25-yr | | 6150.6 | 0.0216 | 8846.1 | 8850.7 | 4.6 | 8850.1 | 8851.7 | 8.28 | 5.47 | 112.5 | 0.200 | 0.050 | 0.200 | 0.73 |
| 50-yr | | 6150.6 | 0.0216 | 8846.1 | 8851.2 | 5.1 | 8850.4 | 8852.2 | 8.52 | 5.41 | 117.9 | 0.200 | 0.050 | 0.200 | 0.71 |
| 10-yr | 51+04.5 | 6060.6 | 0.0140 | 8844.1 | 8848.5 | 4.3 | 8848.1 | 8849.7 | 9.34 | 6.45 | 77.9 | 0.200 | 0.050 | 0.200 | 0.83 |
| 25-yr | | 6060.6 | 0.0140 | 8844.1 | 8849.0 | 4.8 | 8848.7 | 8850.5 | 10.37 | 6.77 | 86.4 | 0.200 | 0.050 | 0.200 | 0.87 |
| 50-yr | | 6060.6 | 0.0140 | 8844.1 | 8849.3 | 5.2 | 8849.2 | 8851.1 | 11.09 | 7.00 | 92.1 | 0.200 | 0.050 | 0.200 | 0.90 |
| 10-yr | 50+30.0 | 5986.1 | 0.0151 | 8843.1 | 8847.6 | 4.5 | 8847.0 | 8848.5 | 8.34 | 5.22 | 101.6 | 0.200 | 0.050 | 0.200 | 0.73 |
| 25-yr | | 5986.1 | 0.0151 | 8843.1 | 8848.1 | 5.0 | 8847.5 | 8849.3 | 9.24 | 5.40 | 116.3 | 0.200 | 0.050 | 0.200 | 0.76 |
| 50-yr | | 5986.1 | 0.0151 | 8843.1 | 8848.4 | 5.3 | 8848.0 | 8849.7 | 10.00 | 5.64 | 123.3 | 0.200 | 0.050 | 0.200 | 0.80 |
| 10-yr | 49+30.7 | 5886.8 | 0.0216 | 8841.9 | 8845.2 | 4.2 | 8844.5 | 8845.9 | 9.86 | 3.39 | 164.2 | 0.200 | 0.050 | 0.080 | 0.99 |
| 25-yr | | 5886.8 | 0.0216 | 8841.9 | 8845.5 | 4.5 | 8845.1 | 8846.5 | 11.18 | 3.73 | 173.1 | 0.200 | 0.050 | 0.080 | 1.06 |
| 50-yr | | 5886.8 | 0.0216 | 8841.9 | 8845.8 | 4.8 | 8845.2 | 8846.8 | 11.83 | 3.91 | 178.8 | 0.200 | 0.050 | 0.080 | 1.08 |
| 10-yr | 48+35.7 | 5791.8 | 0.0300 | 8839.5 | 8843.0 | 4.0 | | 8843.4 | 8.20 | 2.59 | 202.1 | 0.200 | 0.050 | 0.080 | 0.81 |
| 25-yr | | 5791.8 | 0.0300 | 8839.5 | 8843.5 | 4.5 | | 8844.0 | 8.80 | 2.74 | 213.2 | 0.200 | 0.050 | 0.080 | 0.81 |
| 50-yr | | 5791.8 | 0.0300 | 8839.5 | 8843.8 | 4.9 | | 8844.4 | 9.19 | 2.82 | 222.8 | 0.200 | 0.050 | 0.080 | 0.81 |
| 10-yr | 47+50.6 | 5706.7 | 0.0211 | 8837.3 | 8841.8 | 5.1 | | 8842.2 | 6.56 | 2.34 | 172.3 | 0.200 | 0.050 | 0.080 | 0.57 |
| 25-yr | | 5706.7 | 0.0211 | 8837.3 | 8842.4 | 5.7 | | 8842.8 | 7.10 | 2.52 | 179.4 | 0.200 | 0.050 | 0.080 | 0.58 |
| 50-yr | | 5706.7 | 0.0211 | 8837.3 | 8842.8 | 6.1 | | 8843.2 | 7.47 | 2.65 | 184.6 | 0.199 | 0.050 | 0.080 | 0.59 |
| 10-yr | 46+60.7 | 5616.8 | 0.0198 | 8835.5 | 8839.9 | 4.4 | 8839.9 | 8841.0 | 10.45 | 4.07 | 129.5 | 0.198 | 0.050 | 0.160 | 0.92 |
| 25-yr | | 5616.8 | 0.0198 | 8835.5 | 8840.3 | 4.8 | 8840.3 | 8841.7 | 11.52 | 4.40 | 132.3 | 0.197 | 0.050 | 0.160 | 0.96 |
| 50-yr | | 5616.8 | 0.0198 | 8835.5 | 8840.6 | 5.2 | 8840.6 | 8842.1 | 12.10 | 4.56 | 134.6 | 0.197 | 0.050 | 0.160 | 0.97 |
| 10-yr | 45+51.3 | 5507.4 | 0.0124 | 8833.5 | 8836.4 | 4.4 | 8835.2 | 8837.4 | 10.28 | 4.40 | 132.1 | 0.198 | 0.050 | 0.200 | 1.10 |
| 25-yr | | 5507.4 | 0.0124 | 8833.5 | 8836.8 | 4.8 | 8836.7 | 8838.0 | 11.45 | 4.79 | 144.0 | 0.198 | 0.050 | 0.200 | 1.15 |
| 50-yr | | 5507.4 | 0.0124 | 8833.5 | 8837.1 | 5.1 | 8837.1 | 8838.4 | 12.03 | 4.94 | 154.3 | 0.197 | 0.050 | 0.200 | 1.16 |

| Plan | Final_r5 | Profile | 10-year | 25-year | 50-year |
|---|---|---|---|---|---|
| | | Flow | 1275 cfs | 1630 cfs | 1900 cfs |

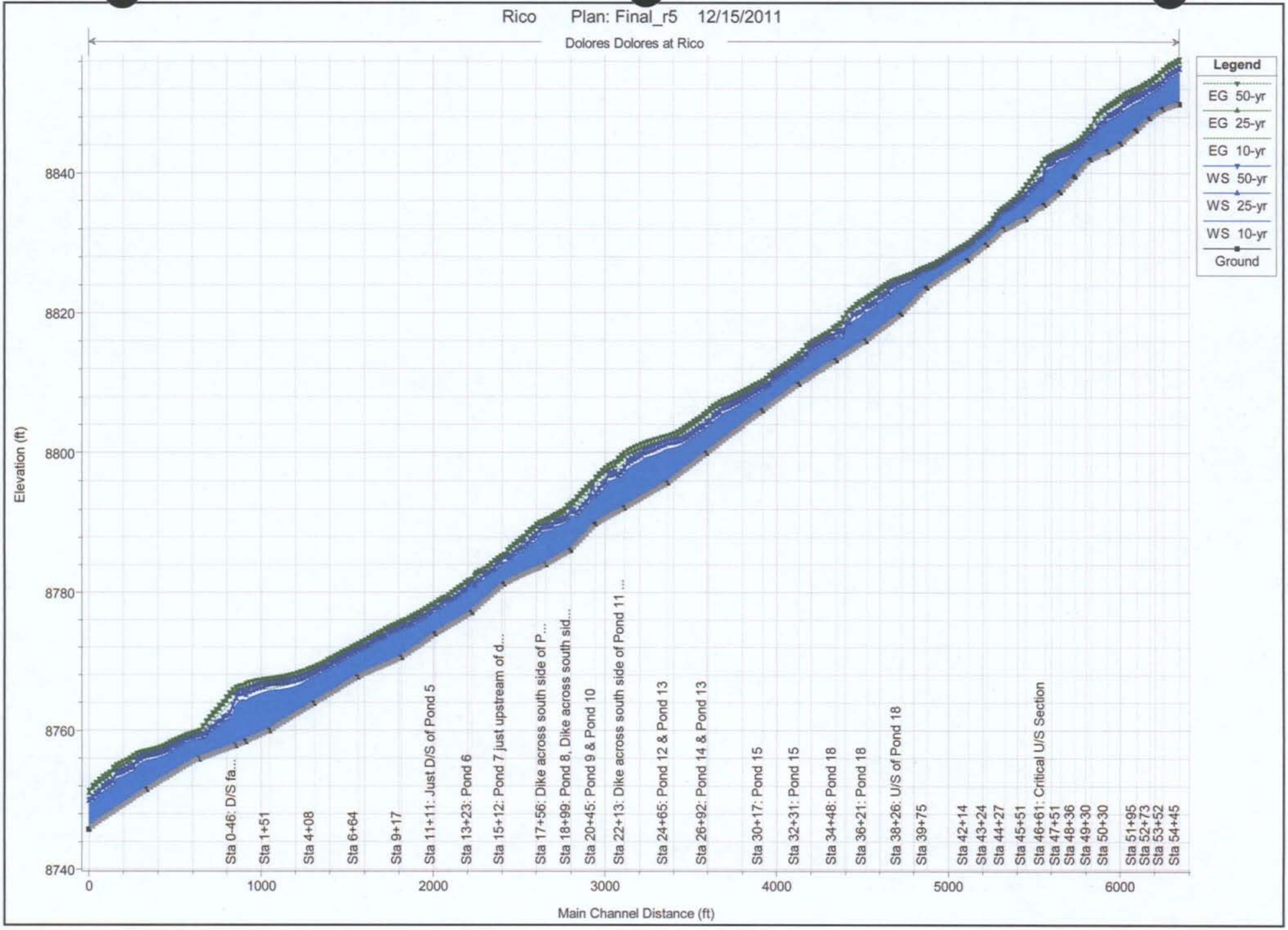
| Profile | River Sta | RAS River Sta | Slope Invert | Min Ch El (ft) | W.S. El (ft) | Max Chl Dpth (ft) | Crit W.S. (ft) | E.G. Elev (ft) | Vel Chnl (ft/s) | Vel Total (ft/s) | Top Width (ft) | Mann Wtd Left | Mann Wtd Chnl | Mann Wtd Rght | Froude # Chnl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-yr | 44+26.5 | 5382.6 | 0.0223 | 8832.1 | 8834.3 | 6.9 | 8831.0 | 8834.5 | 5.21 | 2.52 | 160.5 | 0.195 | 0.050 | 0.200 | 0.64 |
| 25-yr | | 5382.6 | 0.0223 | 8832.1 | 8834.7 | 7.4 | 8831.5 | 8835.0 | 6.07 | 2.82 | 169.3 | 0.194 | 0.050 | 0.200 | 0.68 |
| 50-yr | | 5382.6 | 0.0223 | 8832.1 | 8835.0 | 7.6 | 8831.8 | 8835.3 | 6.64 | 3.02 | 175.9 | 0.194 | 0.050 | 0.200 | 0.70 |
| 10-yr | 43+24.3 | 5280.4 | 0.0201 | 8829.8 | 8831.4 | 6.1 | 8829.1 | 8831.6 | 4.59 | 3.51 | 134.5 | 0.149 | 0.050 | 0.200 | 0.69 |
| 25-yr | | 5280.4 | 0.0201 | 8829.8 | 8831.8 | 6.5 | 8829.6 | 8832.1 | 5.61 | 3.84 | 145.7 | 0.148 | 0.050 | 0.200 | 0.74 |
| 50-yr | | 5280.4 | 0.0201 | 8829.8 | 8832.1 | 6.8 | 8830.3 | 8832.4 | 6.27 | 4.06 | 153.6 | 0.147 | 0.050 | 0.200 | 0.76 |
| 10-yr | 42+14.0 | 5170.1 | 0.0166 | 8827.5 | 8829.2 | 5.4 | 8827.2 | 8829.4 | 4.95 | 3.16 | 171.6 | 0.147 | 0.050 | 0.180 | 0.70 |
| 25-yr | | 5170.1 | 0.0166 | 8827.5 | 8829.7 | 5.8 | 8827.9 | 8829.9 | 5.84 | 3.41 | 190.9 | 0.147 | 0.050 | 0.180 | 0.73 |
| 50-yr | | 5170.1 | 0.0166 | 8827.5 | 8829.9 | 6.1 | 8828.2 | 8830.2 | 6.42 | 3.56 | 206.6 | 0.147 | 0.050 | 0.180 | 0.75 |
| 10-yr | 39+75.4 | 4931.5 | 0.0257 | 8823.6 | 8825.9 | 4.9 | 8823.5 | 8826.0 | 4.14 | 2.27 | 211.9 | 0.156 | 0.050 | 0.180 | 0.52 |
| 25-yr | | 4931.5 | 0.0257 | 8823.6 | 8826.3 | 5.3 | 8824.0 | 8826.5 | 4.81 | 2.48 | 251.2 | 0.156 | 0.050 | 0.180 | 0.55 |
| 50-yr | | 4931.5 | 0.0257 | 8823.6 | 8826.6 | 5.6 | 8824.2 | 8826.8 | 5.24 | 2.59 | 287.1 | 0.156 | 0.050 | 0.180 | 0.57 |
| 10-yr | 38+25.6 | 4781.7 | 0.0188 | 8819.8 | 8823.9 | 4.1 | 8823.0 | 8824.2 | 6.39 | 2.13 | 289.6 | 0.174 | 0.050 | 0.180 | 0.57 |
| 25-yr | | 4781.7 | 0.0188 | 8819.8 | 8824.5 | 4.6 | 8823.3 | 8824.8 | 6.82 | 2.26 | 346.9 | 0.174 | 0.050 | 0.180 | 0.57 |
| 50-yr | | 4781.7 | 0.0188 | 8819.8 | 8824.8 | 5.0 | 8823.5 | 8825.2 | 7.11 | 2.35 | 364.4 | 0.174 | 0.050 | 0.180 | 0.57 |
| 10-yr | 36+21.3 | 4577.4 | 0.0161 | 8816.0 | 8820.2 | 4.2 | 8819.7 | 8821.1 | 8.52 | 4.36 | 184.4 | 0.200 | 0.051 | 0.180 | 0.76 |
| 25-yr | | 4577.4 | 0.0161 | 8816.0 | 8820.8 | 4.8 | 8820.2 | 8821.8 | 9.09 | 4.47 | 220.4 | 0.198 | 0.051 | 0.180 | 0.75 |
| 50-yr | | 4577.4 | 0.0161 | 8816.0 | 8821.2 | 5.2 | 8820.6 | 8822.3 | 9.53 | 4.57 | 241.9 | 0.197 | 0.051 | 0.180 | 0.76 |
| 10-yr | 34+48.0 | 4404.1 | 0.0137 | 8813.2 | 8816.6 | 3.5 | 8816.1 | 8817.4 | 7.67 | 4.42 | 208.7 | 0.200 | 0.050 | 0.096 | 0.74 |
| 25-yr | | 4404.1 | 0.0137 | 8813.2 | 8817.2 | 4.0 | 8816.5 | 8817.9 | 8.01 | 4.01 | 230.8 | 0.200 | 0.050 | 0.118 | 0.72 |
| 50-yr | | 4404.1 | 0.0137 | 8813.2 | 8817.5 | 4.3 | 8817.0 | 8818.3 | 8.47 | 4.02 | 240.5 | 0.200 | 0.050 | 0.126 | 0.73 |
| 10-yr | 32+30.9 | 4187.0 | 0.0175 | 8809.8 | 8812.8 | 3.0 | 8812.5 | 8813.5 | 7.93 | 4.67 | 146.2 | 0.196 | 0.050 | 0.115 | 0.86 |
| 25-yr | | 4187.0 | 0.0175 | 8809.8 | 8813.1 | 3.3 | 8812.9 | 8813.9 | 8.66 | 4.97 | 151.6 | 0.189 | 0.050 | 0.118 | 0.88 |
| 50-yr | | 4187.0 | 0.0175 | 8809.8 | 8813.4 | 3.6 | 8813.1 | 8814.3 | 9.14 | 5.16 | 154.9 | 0.184 | 0.050 | 0.120 | 0.89 |
| 10-yr | 30+17.4 | 3973.5 | 0.0188 | 8806.0 | 8808.9 | 2.9 | 8808.4 | 8809.5 | 6.84 | 3.83 | 154.8 | 0.196 | 0.050 | 0.199 | 0.72 |
| 25-yr | | 3973.5 | 0.0188 | 8806.0 | 8809.4 | 3.3 | 8808.8 | 8810.0 | 7.36 | 4.03 | 161.2 | 0.196 | 0.050 | 0.199 | 0.72 |
| 50-yr | | 3973.5 | 0.0188 | 8806.0 | 8809.7 | 3.6 | 8809.0 | 8810.4 | 7.70 | 4.15 | 165.6 | 0.195 | 0.050 | 0.199 | 0.72 |
| 10-yr | 26+91.7 | 3647.8 | 0.0185 | 8799.9 | 8803.7 | 3.8 | 8803.3 | 8804.8 | 8.65 | 6.29 | 76.8 | 0.200 | 0.050 | 0.200 | 0.82 |
| 25-yr | | 3647.8 | 0.0185 | 8799.9 | 8804.2 | 4.3 | 8803.8 | 8805.5 | 9.46 | 6.64 | 81.2 | 0.200 | 0.050 | 0.200 | 0.83 |
| 50-yr | | 3647.8 | 0.0185 | 8799.9 | 8804.5 | 4.6 | 8804.2 | 8806.0 | 10.13 | 6.96 | 83.9 | 0.200 | 0.050 | 0.200 | 0.85 |
| 10-yr | 24+64.6 | 3420.7 | 0.0139 | 8795.7 | 8800.6 | 4.9 | 8799.4 | 8801.1 | 6.59 | 3.61 | 112.6 | 0.171 | 0.050 | 0.200 | 0.55 |
| 25-yr | | 3420.7 | 0.0139 | 8795.7 | 8801.3 | 5.6 | 8799.9 | 8801.9 | 7.00 | 3.70 | 117.9 | 0.165 | 0.051 | 0.200 | 0.54 |
| 50-yr | | 3420.7 | 0.0139 | 8795.7 | 8801.9 | 6.1 | 8800.2 | 8802.5 | 7.28 | 3.78 | 121.3 | 0.162 | 0.051 | 0.200 | 0.53 |

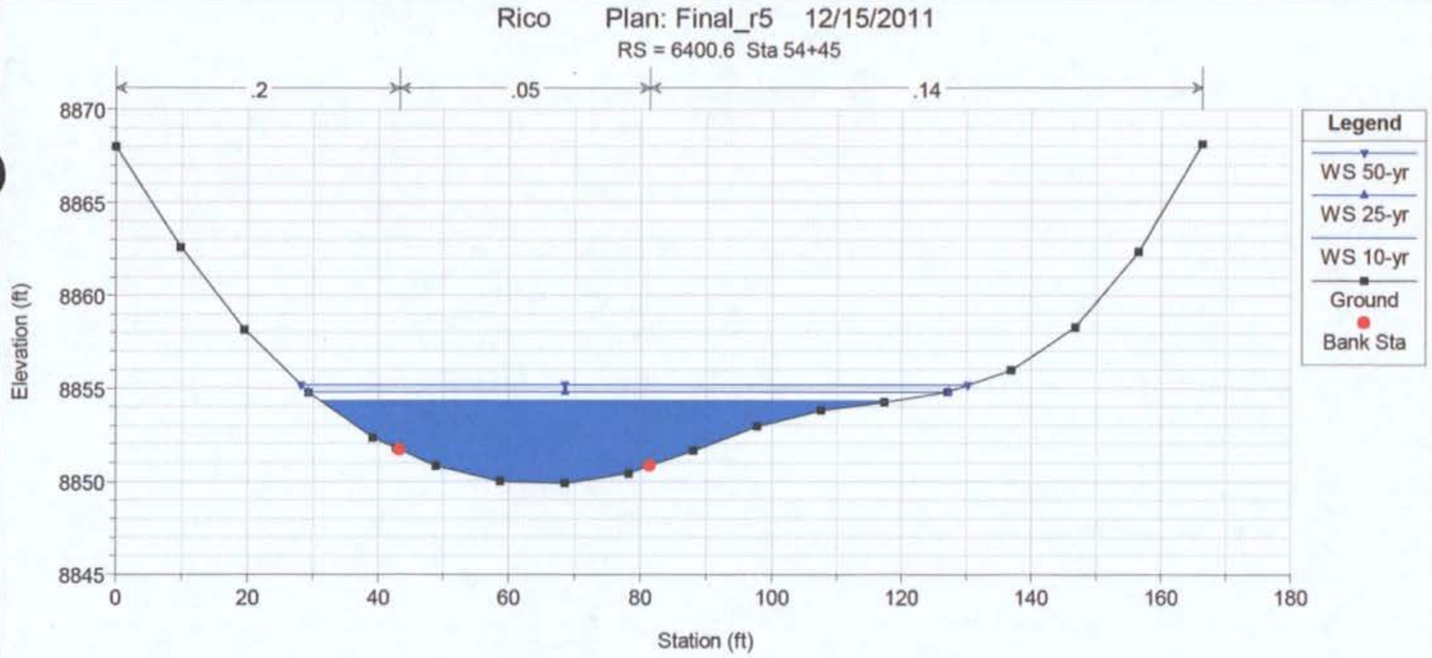
| Plan | Final_r5 | Profile | 10-year | 25-year | 50-year |
|---|---|---|---|---|---|
| | | Flow | 1275 cfs | 1630 cfs | 1900 cfs |

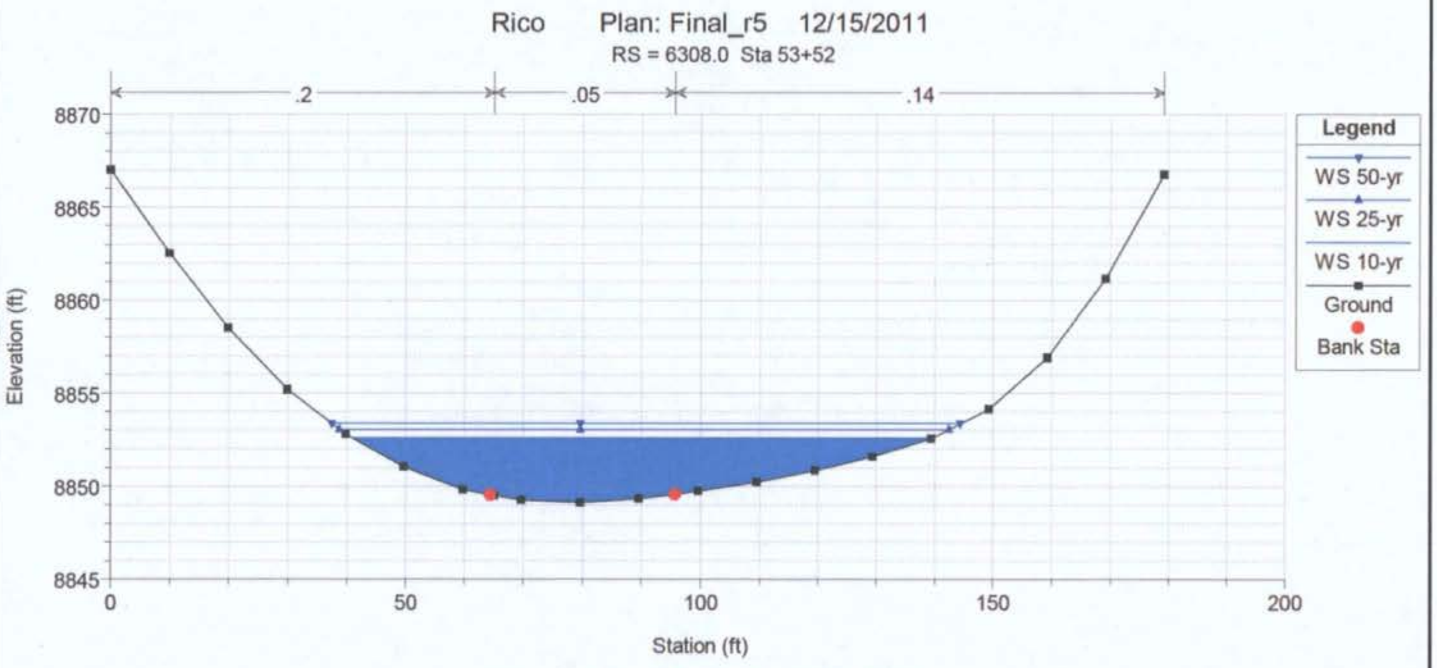
| Profile | River Sta | RAS River Sta | Slope Invert | Min Ch El (ft) | W.S. El (ft) | Max Chl Dpth (ft) | Crit W.S. (ft) | E.G. Elev (ft) | Vel Chnl (ft/s) | Vel Total (ft/s) | Top Width (ft) | Mann Wtd Left | Mann Wtd Chnl | Mann Wtd Rght | Froude # Chnl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-yr | 22+13.0 | 3169.1 | 0.0140 | 8792.2 | 8797.0 | 4.8 | 8796.9 | 8798.6 | 10.55 | 7.79 | 55.5 | 0.162 | 0.050 | 0.200 | 0.93 |
| 25-yr | | 3169.1 | 0.0140 | 8792.2 | 8797.6 | 5.4 | 8797.6 | 8799.5 | 11.61 | 8.28 | 59.1 | 0.158 | 0.050 | 0.200 | 0.95 |
| 50-yr | | 3169.1 | 0.0140 | 8792.2 | 8798.1 | 5.9 | 8798.1 | 8800.1 | 12.12 | 8.43 | 61.9 | 0.155 | 0.050 | 0.200 | 0.95 |
| 10-yr | 20+44.8 | 3000.9 | 0.0264 | 8789.9 | 8793.6 | 3.7 | 8793.9 | 8795.3 | 11.18 | 7.34 | 77.8 | 0.172 | 0.050 | 0.200 | 1.07 |
| 25-yr | | 3000.9 | 0.0264 | 8789.9 | 8794.1 | 4.2 | 8794.5 | 8796.1 | 12.20 | 7.61 | 86.1 | 0.168 | 0.050 | 0.200 | 1.09 |
| 50-yr | | 3000.9 | 0.0264 | 8789.9 | 8794.4 | 4.5 | 8794.8 | 8796.7 | 12.93 | 7.80 | 91.9 | 0.166 | 0.050 | 0.200 | 1.11 |
| 10-yr | 18+99.0 | 2855.1 | 0.0134 | 8786.1 | 8791.1 | 5.0 | 8790.2 | 8791.8 | 7.07 | 4.12 | 116.0 | 0.110 | 0.050 | 0.200 | 0.60 |
| 25-yr | | 2855.1 | 0.0134 | 8786.1 | 8791.7 | 5.6 | 8790.7 | 8792.4 | 7.71 | 4.30 | 122.6 | 0.110 | 0.050 | 0.200 | 0.62 |
| 50-yr | | 2855.1 | 0.0134 | 8786.1 | 8792.1 | 6.0 | 8791.0 | 8792.9 | 8.14 | 4.42 | 126.5 | 0.110 | 0.050 | 0.200 | 0.63 |
| 10-yr | 17+56.2 | 2712.3 | 0.0102 | 8784.0 | 8788.8 | 4.8 | 8788.0 | 8789.5 | 7.29 | 3.98 | 141.1 | 0.110 | 0.050 | 0.200 | 0.61 |
| 25-yr | | 2712.3 | 0.0102 | 8784.0 | 8789.4 | 5.4 | 8788.6 | 8790.2 | 8.00 | 4.09 | 153.9 | 0.110 | 0.050 | 0.200 | 0.63 |
| 50-yr | | 2712.3 | 0.0102 | 8784.0 | 8789.7 | 5.7 | 8788.9 | 8790.6 | 8.51 | 4.17 | 164.4 | 0.110 | 0.050 | 0.200 | 0.65 |
| 10-yr | 15+12.4 | 2468.5 | 0.0222 | 8781.2 | 8784.4 | 3.2 | 8783.9 | 8785.0 | 6.70 | 4.75 | 355.2 | 0.061 | 0.052 | 0.129 | 0.69 |
| 25-yr | | 2468.5 | 0.0222 | 8781.2 | 8785.1 | 3.9 | 8784.3 | 8785.4 | 5.47 | 3.18 | 378.7 | 0.059 | 0.052 | 0.129 | 0.51 |
| 50-yr | | 2468.5 | 0.0222 | 8781.2 | 8785.3 | 4.0 | 8784.4 | 8785.6 | 5.63 | 3.26 | 383.4 | 0.059 | 0.052 | 0.129 | 0.51 |
| 10-yr | 13+23.4 | 2279.5 | 0.0165 | 8777.1 | 8781.2 | 4.1 | 8781.0 | 8781.5 | 6.32 | 3.38 | 297.0 | 0.051 | 0.050 | 0.147 | 0.56 |
| 25-yr | | 2279.5 | 0.0165 | 8777.1 | 8781.4 | 4.4 | 8781.2 | 8781.8 | 6.70 | 3.59 | 309.4 | 0.050 | 0.050 | 0.149 | 0.57 |
| 50-yr | | 2279.5 | 0.0165 | 8777.1 | 8781.6 | 4.5 | 8781.4 | 8782.0 | 6.97 | 3.75 | 320.6 | 0.050 | 0.050 | 0.149 | 0.59 |
| 10-yr | 11+11.1 | 2067.2 | 0.0237 | 8774.0 | 8777.2 | 3.2 | 8776.7 | 8777.8 | 6.69 | 3.93 | 281.7 | 0.200 | 0.050 | 0.102 | 0.68 |
| 25-yr | | 2067.2 | 0.0237 | 8774.0 | 8777.6 | 3.6 | 8776.7 | 8778.3 | 7.15 | 3.69 | 296.5 | 0.200 | 0.050 | 0.107 | 0.68 |
| 50-yr | | 2067.2 | 0.0237 | 8774.0 | 8777.9 | 3.9 | 8777.5 | 8778.6 | 7.52 | 3.63 | 321.1 | 0.200 | 0.050 | 0.108 | 0.69 |
| 10-yr | 9+17.0 | 1873.1 | 0.0108 | 8770.5 | 8774.4 | 3.9 | 8773.7 | 8775.1 | 7.12 | 3.46 | 278.6 | 0.200 | 0.050 | 0.200 | 0.66 |
| 25-yr | | 1873.1 | 0.0108 | 8770.5 | 8774.8 | 4.3 | 8774.2 | 8775.6 | 7.72 | 3.37 | 298.8 | 0.200 | 0.050 | 0.200 | 0.68 |
| 50-yr | | 1873.1 | 0.0108 | 8770.5 | 8775.1 | 4.6 | 8774.8 | 8775.9 | 8.14 | 3.36 | 343.5 | 0.200 | 0.050 | 0.200 | 0.70 |
| 10-yr | 6+64.1 | 1620.2 | 0.0147 | 8767.7 | 8771.3 | 3.6 | 8771.0 | 8771.9 | 7.34 | 2.64 | 358.8 | 0.200 | 0.051 | 0.191 | 0.70 |
| 25-yr | | 1620.2 | 0.0147 | 8767.7 | 8771.7 | 4.0 | 8771.3 | 8772.3 | 7.87 | 2.61 | 389.0 | 0.200 | 0.051 | 0.191 | 0.71 |
| 50-yr | | 1620.2 | 0.0147 | 8767.7 | 8772.0 | 4.3 | | 8772.6 | 8.15 | 2.61 | 393.4 | 0.200 | 0.051 | 0.191 | 0.71 |
| 10-yr | 4+08.4 | 1364.5 | 0.0152 | 8763.9 | 8767.7 | 3.8 | 8767.4 | 8768.4 | 7.67 | 3.24 | 214.7 | 0.110 | 0.050 | 0.200 | 0.72 |
| 25-yr | | 1364.5 | 0.0152 | 8763.9 | 8768.2 | 4.3 | | 8768.9 | 8.04 | 3.25 | 224.4 | 0.109 | 0.050 | 0.200 | 0.71 |
| 50-yr | | 1364.5 | 0.0152 | 8763.9 | 8768.6 | 4.7 | | 8769.3 | 8.22 | 3.24 | 231.1 | 0.108 | 0.050 | 0.200 | 0.69 |
| 10-yr | 1+51.2 | 1107.3 | 0.0111 | 8760.0 | 8765.7 | 5.8 | | 8766.0 | 4.79 | 2.60 | 147.9 | 0.110 | 0.050 | 0.200 | 0.37 |
| 25-yr | | 1107.3 | 0.0111 | 8760.0 | 8766.6 | 6.6 | | 8766.9 | 5.06 | 2.60 | 163.5 | 0.110 | 0.050 | 0.200 | 0.36 |
| 50-yr | | 1107.3 | 0.0111 | 8760.0 | 8767.2 | 7.2 | | 8767.6 | 5.26 | 2.60 | 175.6 | 0.110 | 0.050 | 0.200 | 0.36 |

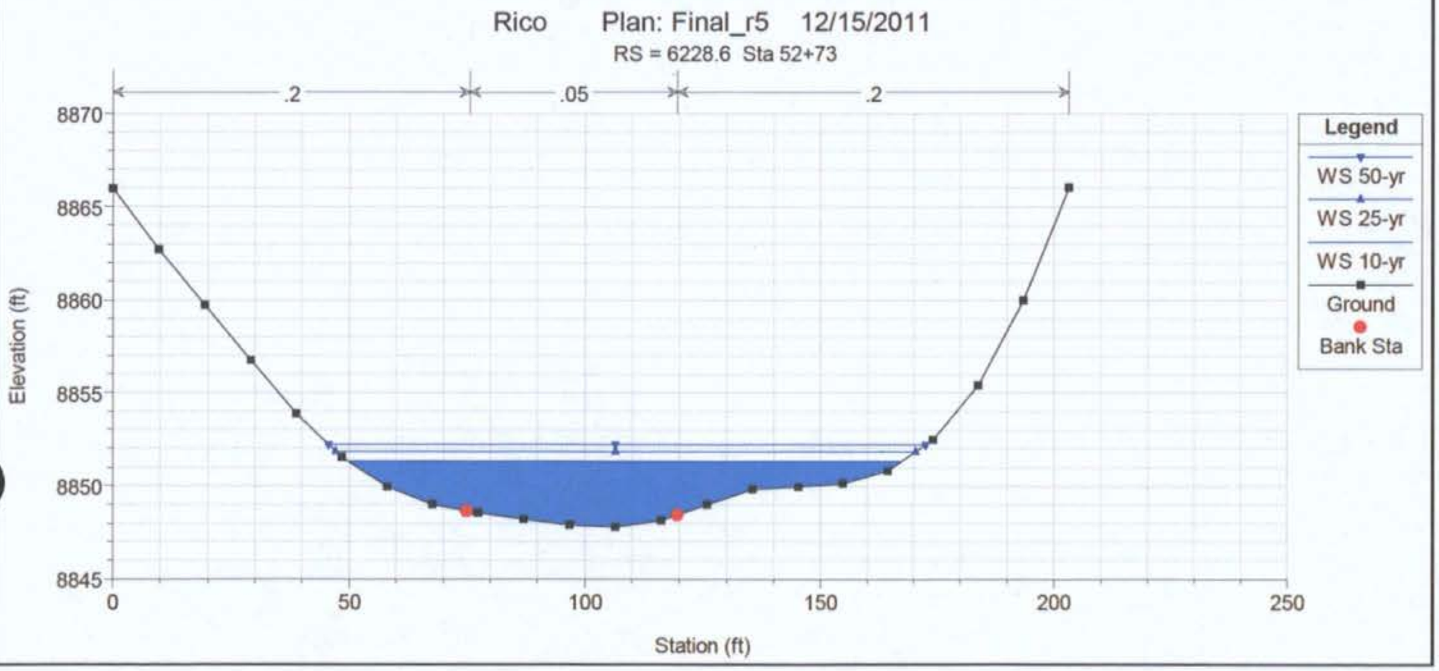
| | | | | | |
|---|---|---|---|---|---|
| Plan | Final_r5 | Profile | 10-year | 25-year | 50-year |
| | | Flow | 1275 cfs | 1630 cfs | 1900 cfs |

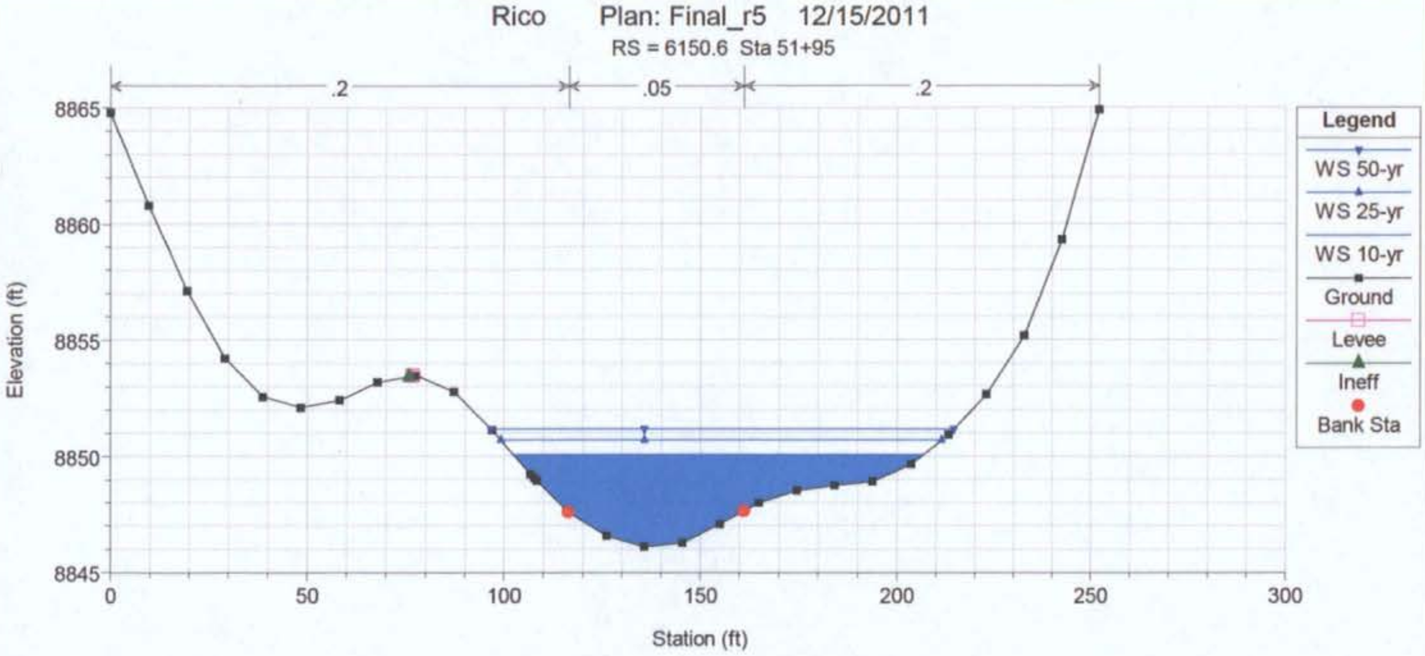
| Profile | River Sta | RAS River Sta | Slope Invert | Min Ch El (ft) | W.S. El (ft) | Max Chl Dpth (ft) | Crit W.S. (ft) | E.G. Elev (ft) | Vel Chnl (ft/s) | Vel Total (ft/s) | Top Width (ft) | Mann Wtd Left | Mann Wtd Chnl | Mann Wtd Rght | Froude # Chnl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-yr | 0+12.2 | 968.3 | 0.0103 | 8758.4 | 8764.3 | 5.9 | | 8765.3 | 8.13 | 6.35 | 57.9 | 0.110 | 0.050 | 0.200 | 0.62 |
| 25-yr | | 968.3 | 0.0103 | 8758.4 | 8765.1 | 6.6 | | 8766.2 | 8.98 | 6.62 | 67.6 | 0.110 | 0.050 | 0.200 | 0.64 |
| 50-yr | | 968.3 | 0.0103 | 8758.4 | 8765.6 | 7.2 | | 8766.8 | 9.38 | 6.72 | 75.1 | 0.110 | 0.050 | 0.200 | 0.64 |
| 10-yr | -0+46.3 | 909.8 | 0.0089 | 8757.8 | 8763.7 | 5.9 | 8763.1 | 8764.7 | 8.87 | 7.39 | 58.5 | 0.071 | 0.050 | 0.053 | 0.69 |
| 25-yr | | 909.8 | 0.0089 | 8757.8 | 8764.6 | 6.7 | 8763.7 | 8765.7 | 9.15 | 7.08 | 70.2 | 0.081 | 0.050 | 0.058 | 0.66 |
| 50-yr | | 909.8 | 0.0089 | 8757.8 | 8765.2 | 7.4 | 8764.1 | 8766.3 | 9.25 | 6.81 | 78.8 | 0.089 | 0.050 | 0.062 | 0.63 |
| 10-yr | -2+56.9 | 699.2 | 0.0062 | 8755.9 | 8758.9 | 3.0 | 8757.9 | 8759.3 | 6.53 | 2.95 | 378.2 | 0.180 | 0.050 | 0.130 | 0.68 |
| 25-yr | | 699.2 | 0.0062 | 8755.9 | 8759.3 | 3.4 | 8758.7 | 8759.7 | 6.47 | 2.68 | 392.6 | 0.180 | 0.050 | 0.130 | 0.63 |
| 50-yr | | 699.2 | 0.0062 | 8755.9 | 8759.7 | 3.8 | 8758.7 | 8760.1 | 6.41 | 2.56 | 403.9 | 0.180 | 0.050 | 0.130 | 0.59 |
| 10-yr | -5+64.4 | 391.7 | 0.0167 | 8751.5 | 8755.7 | 4.2 | 8754.5 | 8756.0 | 5.34 | 2.60 | 182.3 | 0.180 | 0.050 | 0.181 | 0.48 |
| 25-yr | | 391.7 | 0.0167 | 8751.5 | 8756.4 | 4.8 | 8754.9 | 8756.7 | 5.61 | 2.66 | 189.8 | 0.180 | 0.050 | 0.178 | 0.46 |
| 50-yr | | 391.7 | 0.0167 | 8751.5 | 8756.8 | 5.3 | 8755.1 | 8757.2 | 5.80 | 2.71 | 195.1 | 0.180 | 0.050 | 0.176 | 0.46 |
| 10-yr | -9+14.9 | 41.2 | | 8745.7 | 8749.3 | 3.6 | 8749.1 | 8750.3 | 8.70 | 5.48 | 106.7 | 0.180 | 0.050 | 0.200 | 0.84 |
| 25-yr | | 41.2 | | 8745.7 | 8749.8 | 4.1 | 8749.5 | 8751.0 | 9.53 | 5.67 | 119.4 | 0.180 | 0.050 | 0.200 | 0.86 |
| 50-yr | | 41.2 | | 8745.7 | 8750.1 | 4.4 | 8749.9 | 8751.5 | 10.07 | 5.78 | 128.3 | 0.180 | 0.050 | 0.200 | 0.87 |


Rico Plan: Final_r5 12/15/2011
Dolores Dolores at Rico
Legend
EG 50-yr
EG 25-yr
EG 10-yr
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Elevation (ft)
8740
8760
8780
8800
8820
8840
Main Channel Distance (ft)
0
1000
2000
3000
4000
5000
6000
Sta 0-46: D/S fa...
Sta 1+51
Sta 4+08
Sta 6+64
Sta 9+17
Sta 11+11: Just D/S of Pond 5
Sta 13+23: Pond 6
Sta 15+12: Pond 7 just upstream of d...
Sta 17+56: Dike across south side of P...
Sta 18+99: Pond 8, Dike across south sid...
Sta 20+45: Pond 9 & Pond 10
Sta 22+13: Dike across south side of Pond 11 ...
Sta 24+65: Pond 12 & Pond 13
Sta 26+92: Pond 14 & Pond 13
Sta 30+17: Pond 15
Sta 32+31: Pond 15
Sta 34+48: Pond 18
Sta 36+21: Pond 18
Sta 38+26: U/S of Pond 18
Sta 39+75
Sta 42+14
Sta 43+24
Sta 44+27
Sta 45+51
Sta 46+61: Critical U/S Section
Sta 47+51
Sta 48+36
Sta 49+30
Sta 50+30
Sta 51+95
Sta 52+73
Sta 53+52
Sta 54+45

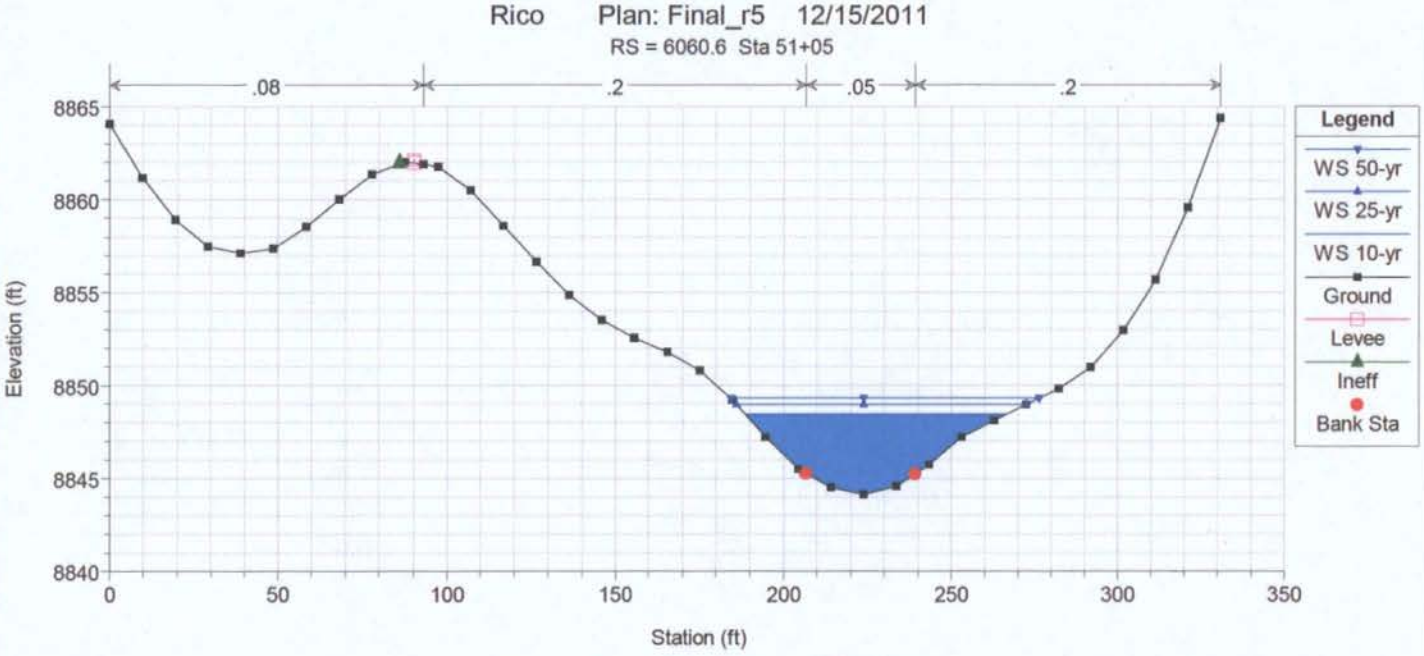

Rico Plan: Final_r5 12/15/2011
RS = 6400.6 Sta 54+45
.2
.05
.14
Elevation (ft)
8845
8850
8855
8860
8865
8870
Station (ft)
0
20
40
60
80
100
120
140
160
180
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Bank Sta


Rico Plan: Final_r5 12/15/2011
RS = 6308.0 Sta 53+52
.2
.05
.14
Elevation (ft)
8845
8850
8855
8860
8865
8870
Station (ft)
0
50
100
150
200
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Bank Sta

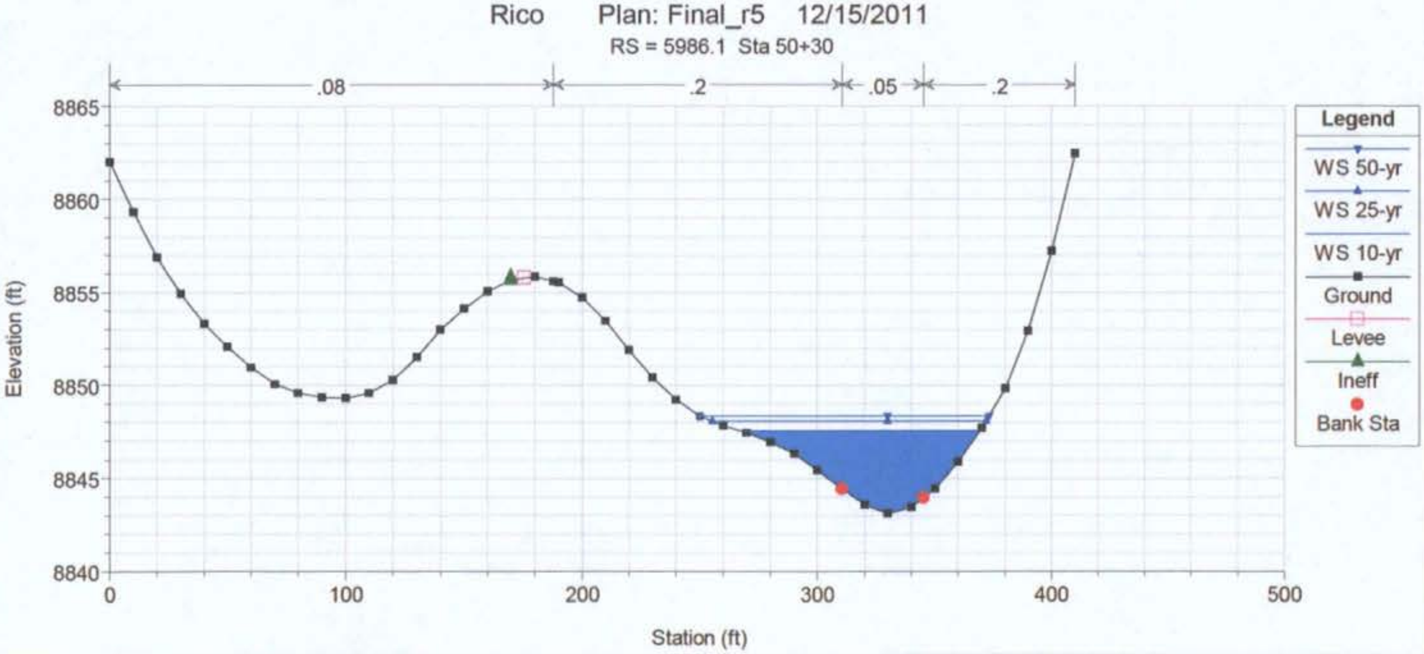

Rico Plan: Final_r5 12/15/2011
RS = 6228.6 Sta 52+73
.2
.05
.2
Elevation (ft)
8845
8850
8855
8860
8865
8870
Station (ft)
0
50
100
150
200
250
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Bank Sta


Rico Plan: Final_r5 12/15/2011

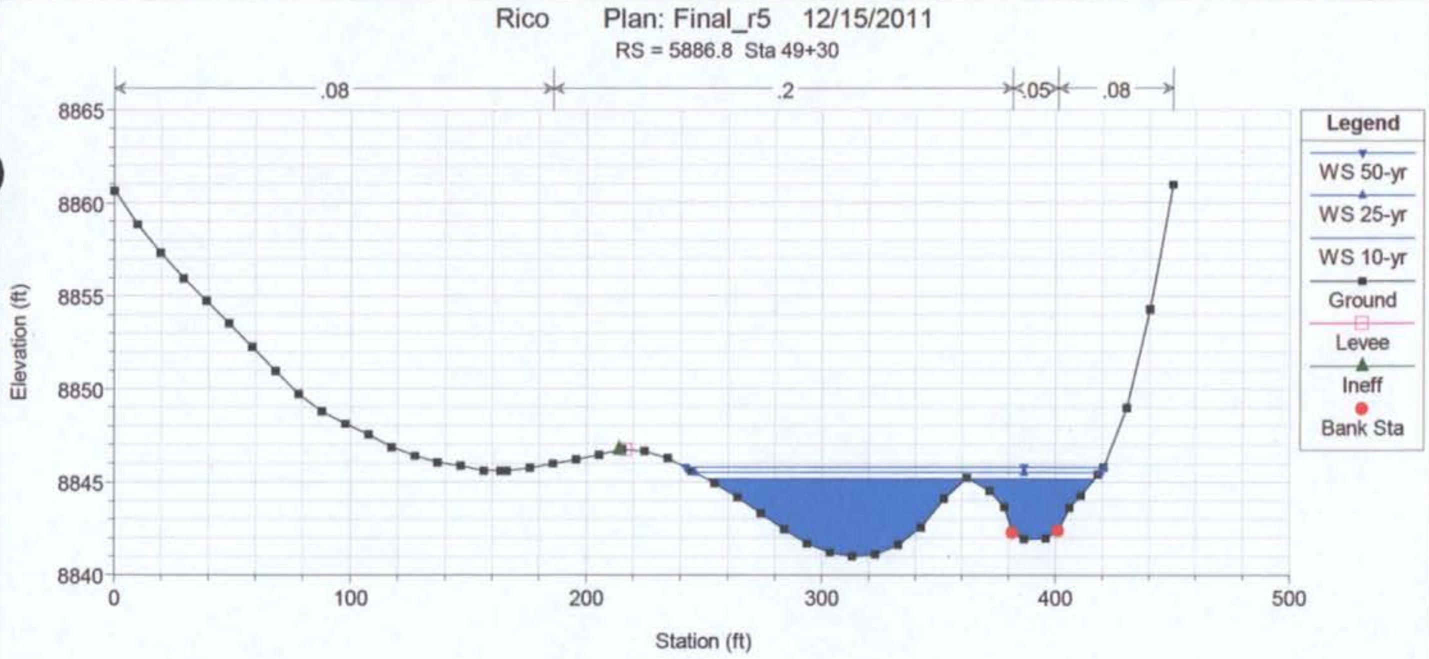
RS = 6150.6 Sta 51+95


Rico Plan: Final_r5 12/15/2011

RS = 6060.6 Sta 51+05


Rico Plan: Final_r5 12/15/2011

RS = 5986.1 Sta 50+30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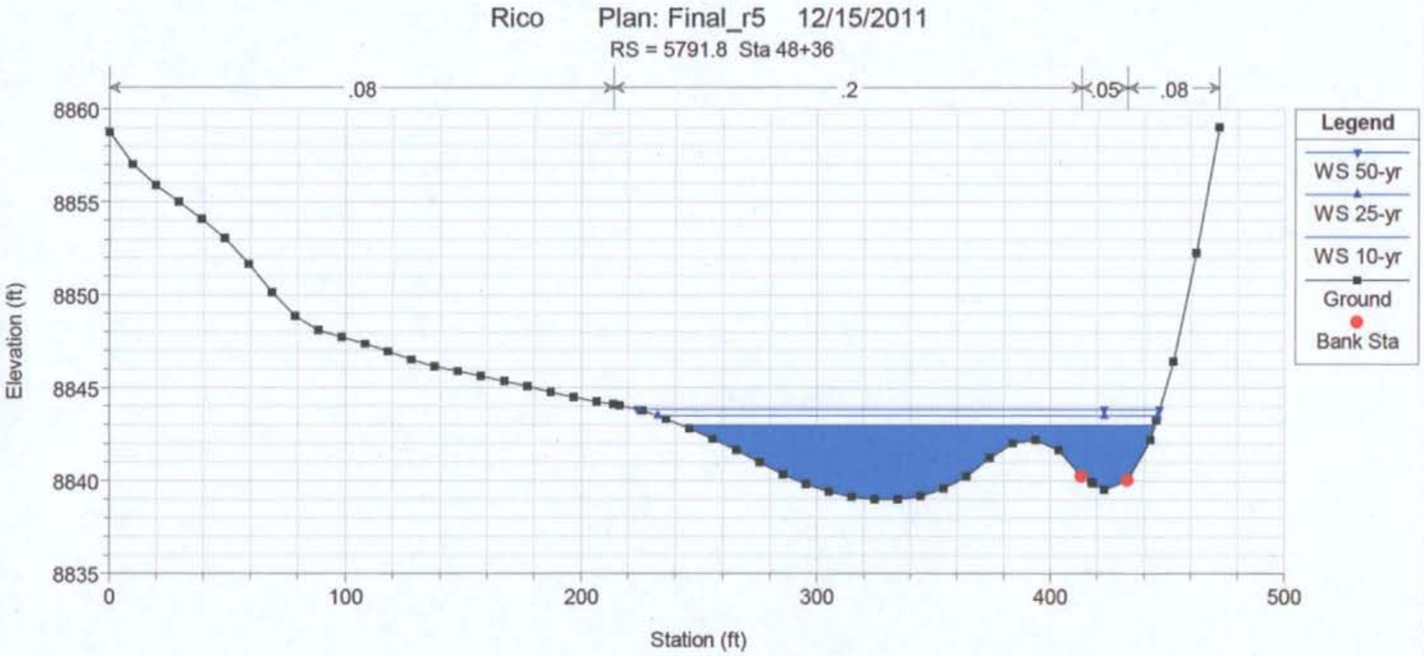
RS = 5886.8 Sta 49+30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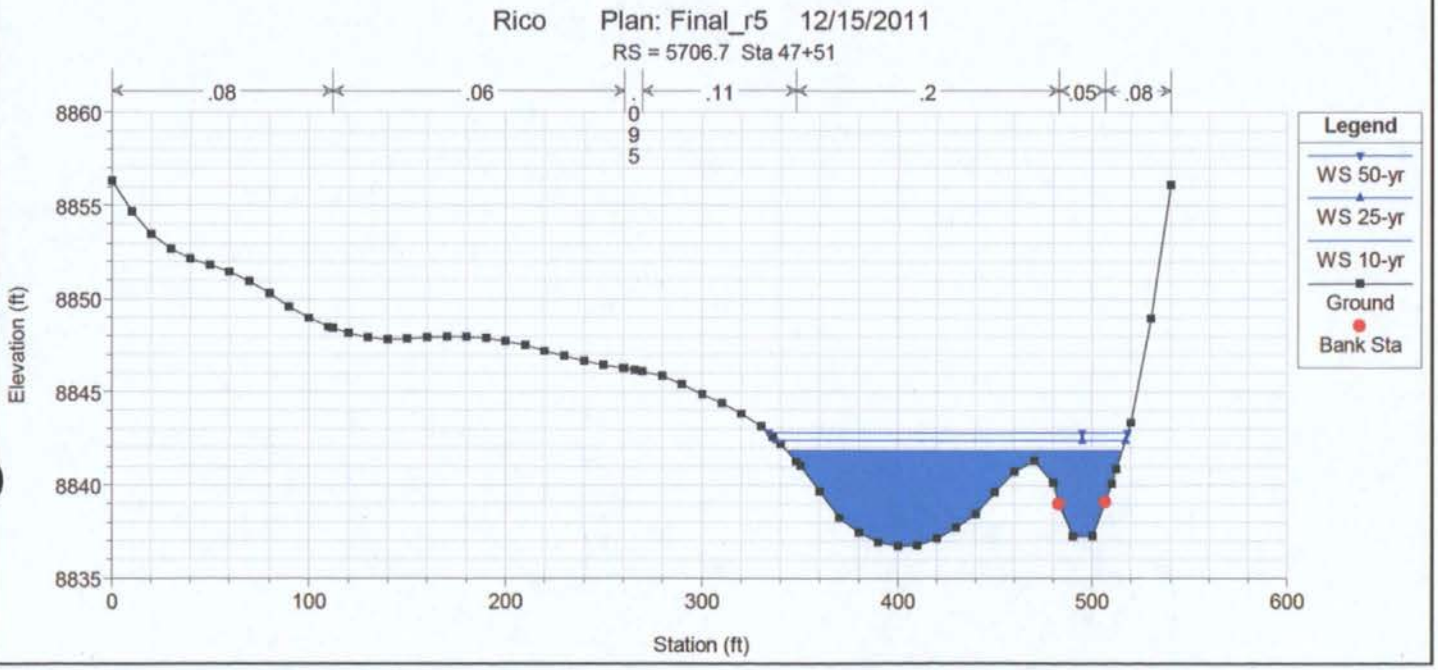
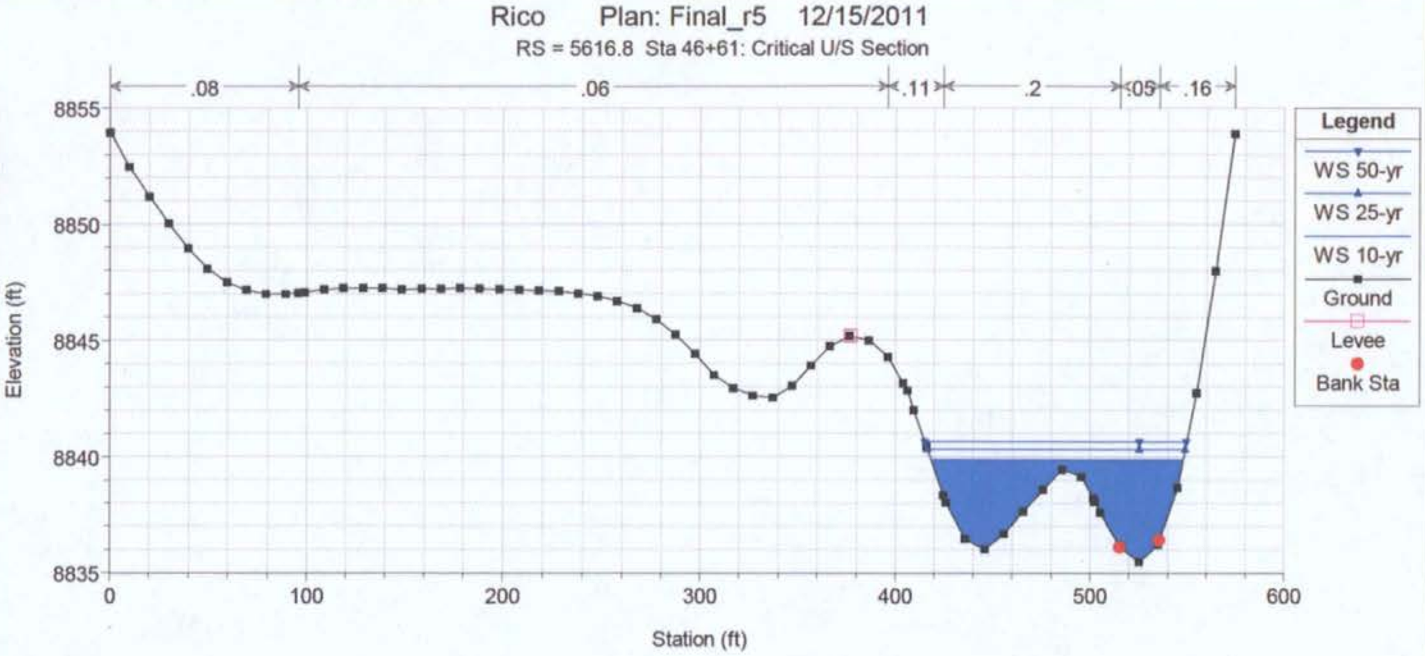
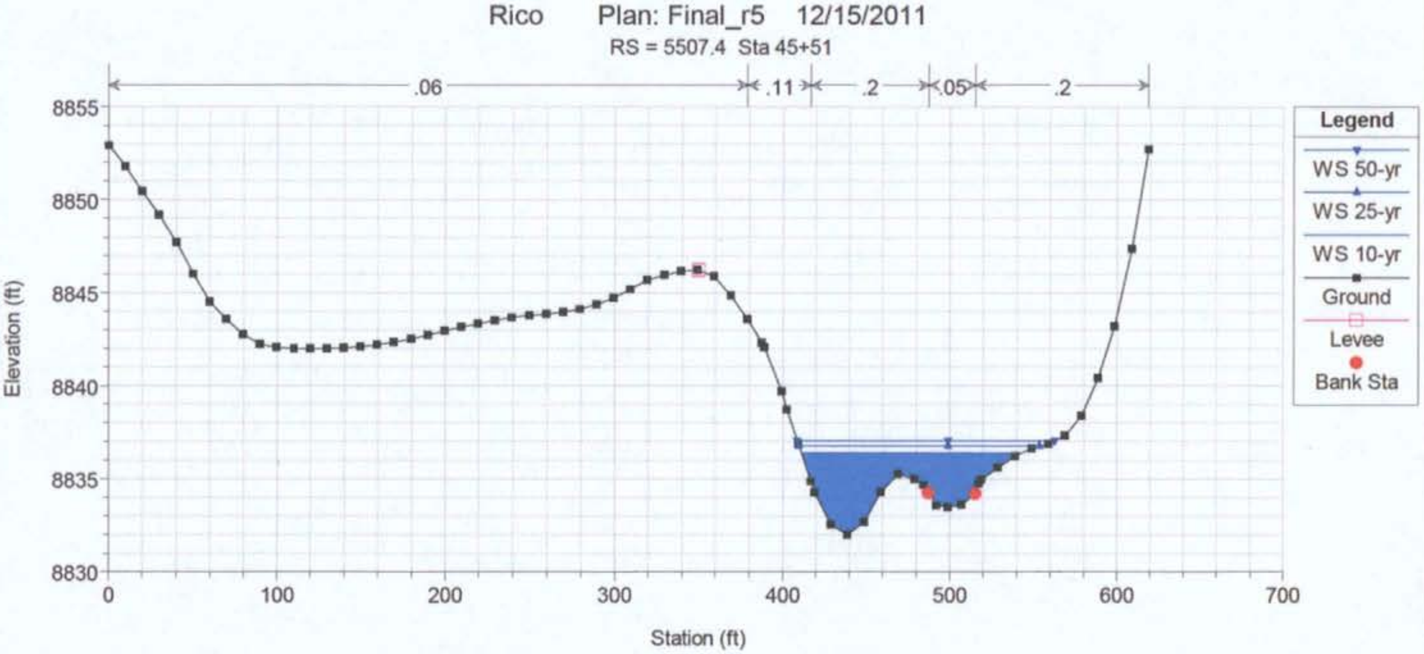
RS = 5791.8 Sta 48+36


Rico Plan: Final_r5 12/15/2011

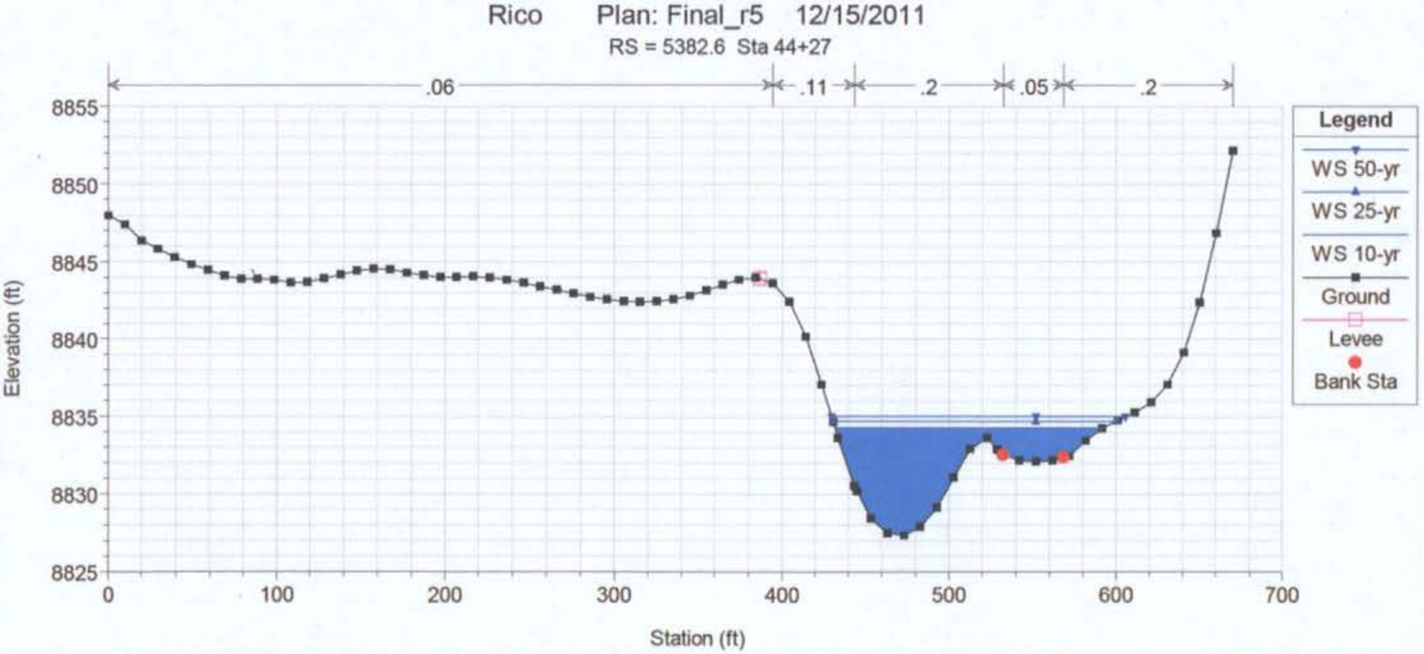
RS = 5706.7 Sta 47+51


Rico Plan: Final_r5 12/15/2011

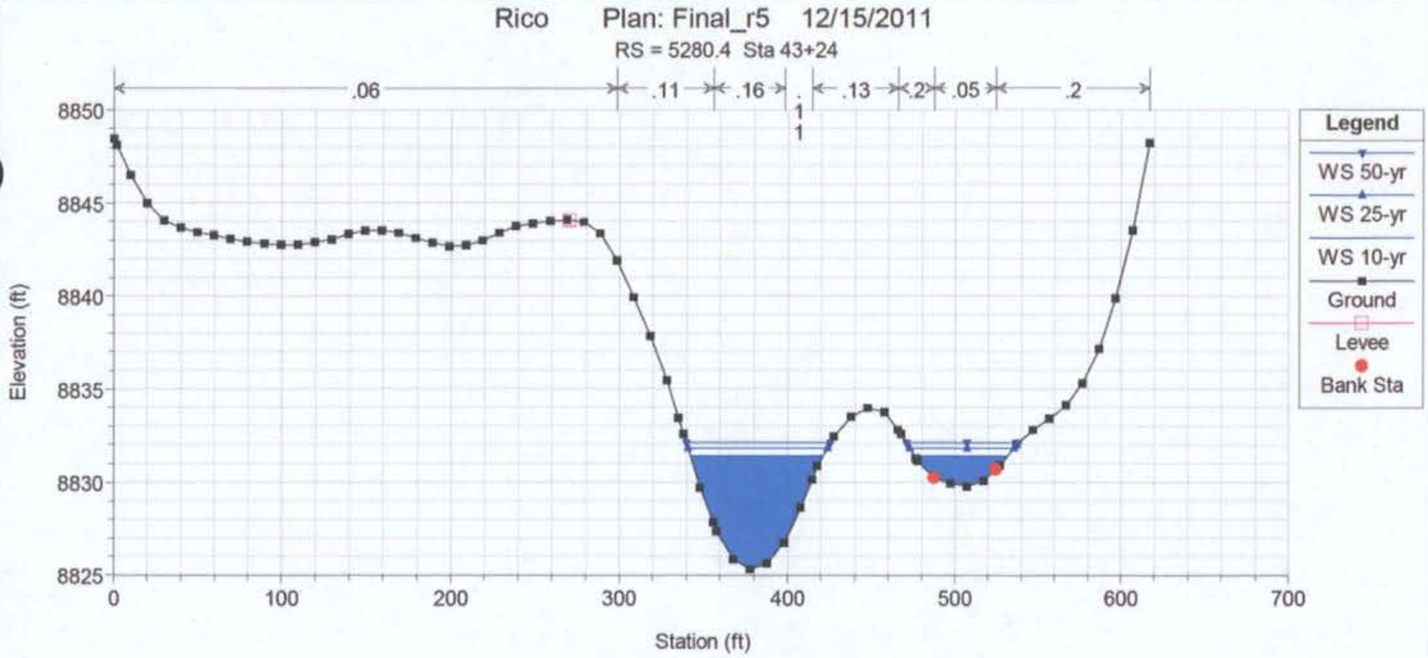
RS = 5616.8 Sta 46+61: Critical U/S Section

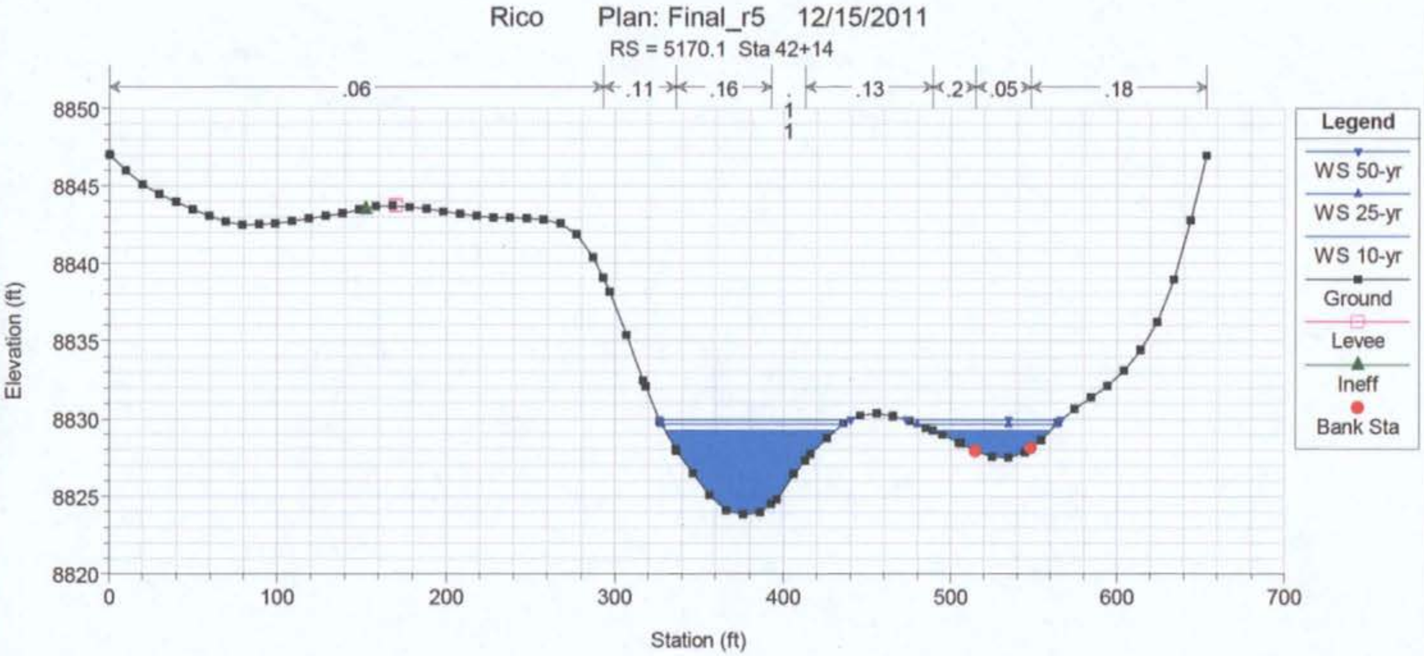

Rico Plan: Final_r5 12/15/2011

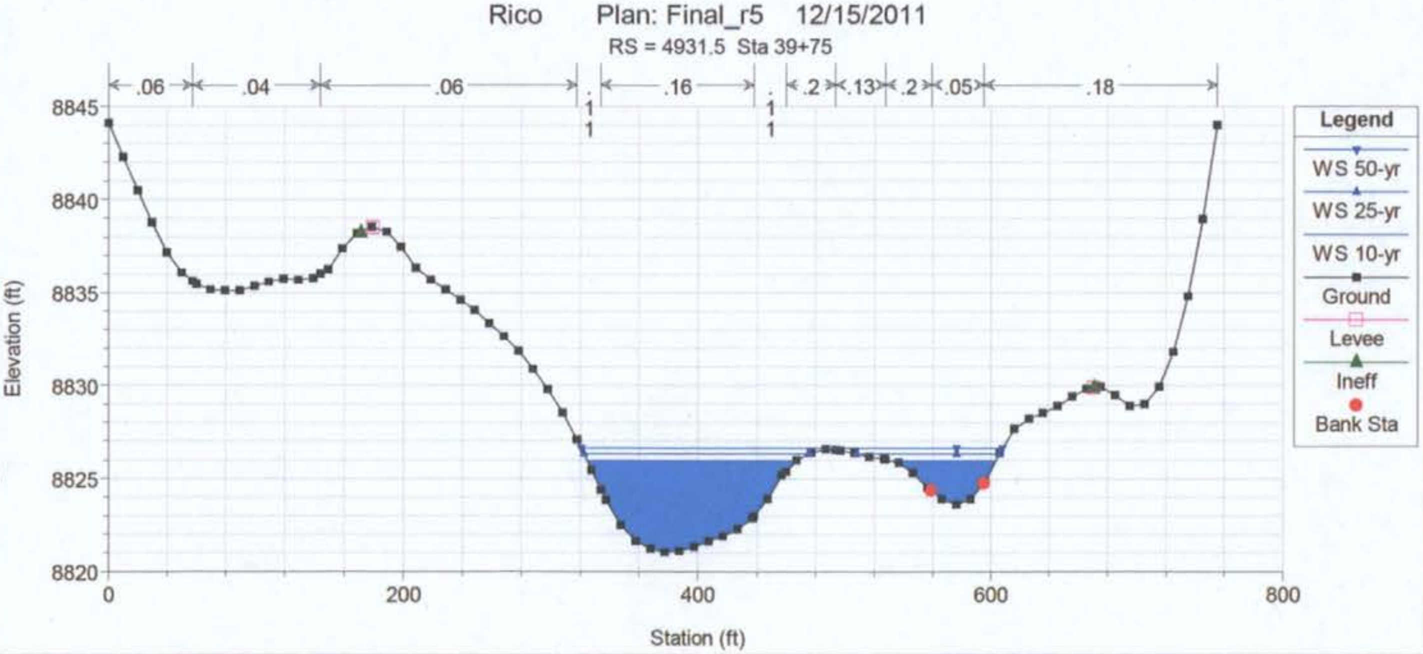
RS = 5507.4 Sta 45+51


Rico Plan: Final_r5 12/15/2011

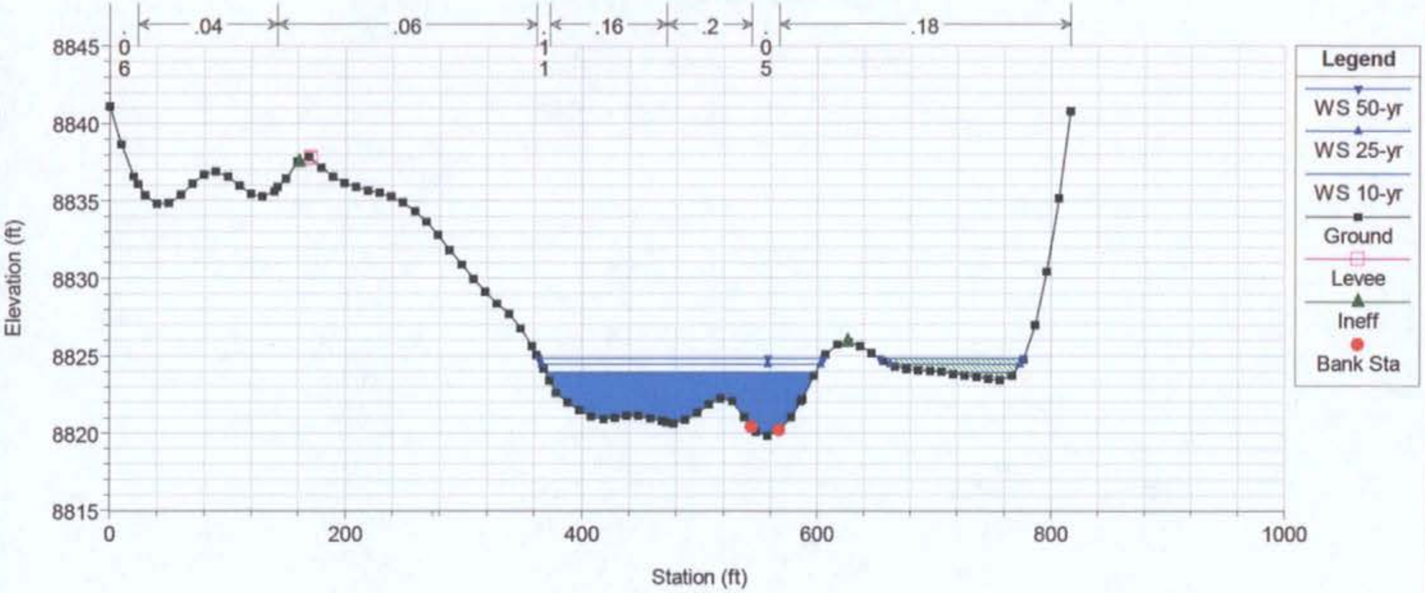
RS = 5382.6 Sta 44+27


Rico Plan: Final_r5 12/15/2011
RS = 5280.4 Sta 43+24

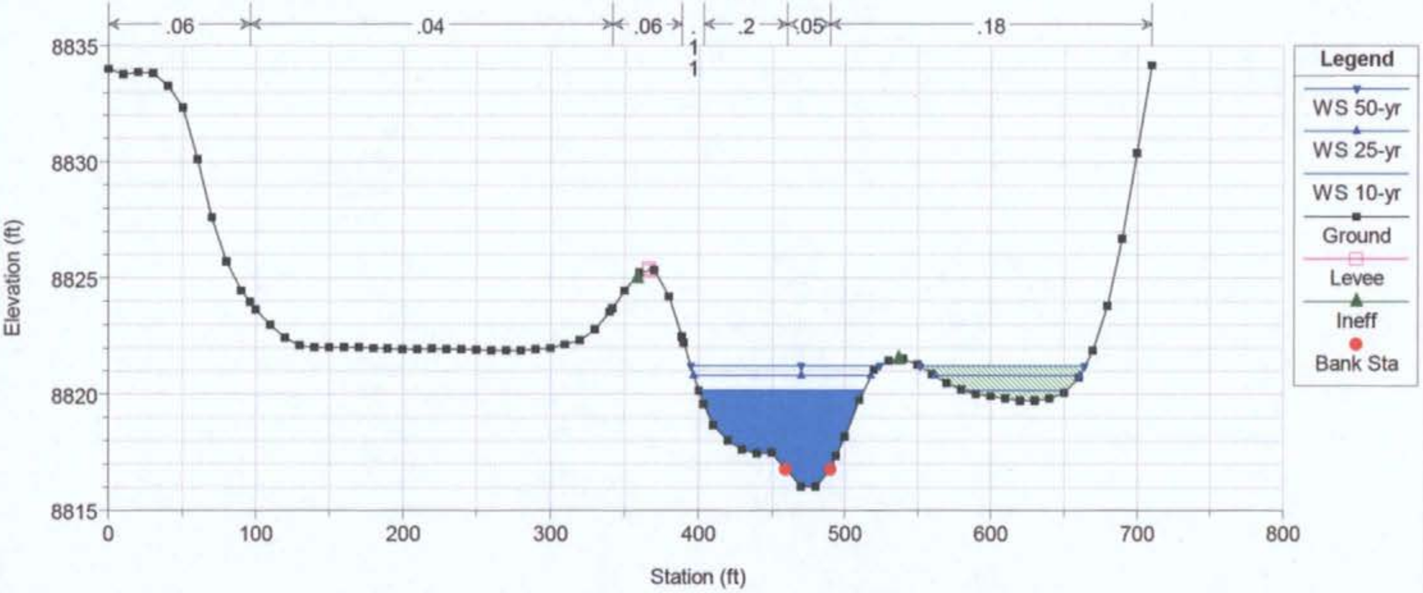

Rico Plan: Final_r5 12/15/2011
RS = 5170.1 Sta 42+14


Rico Plan: Final_r5 12/15/2011
RS = 4931.5 Sta 39+75

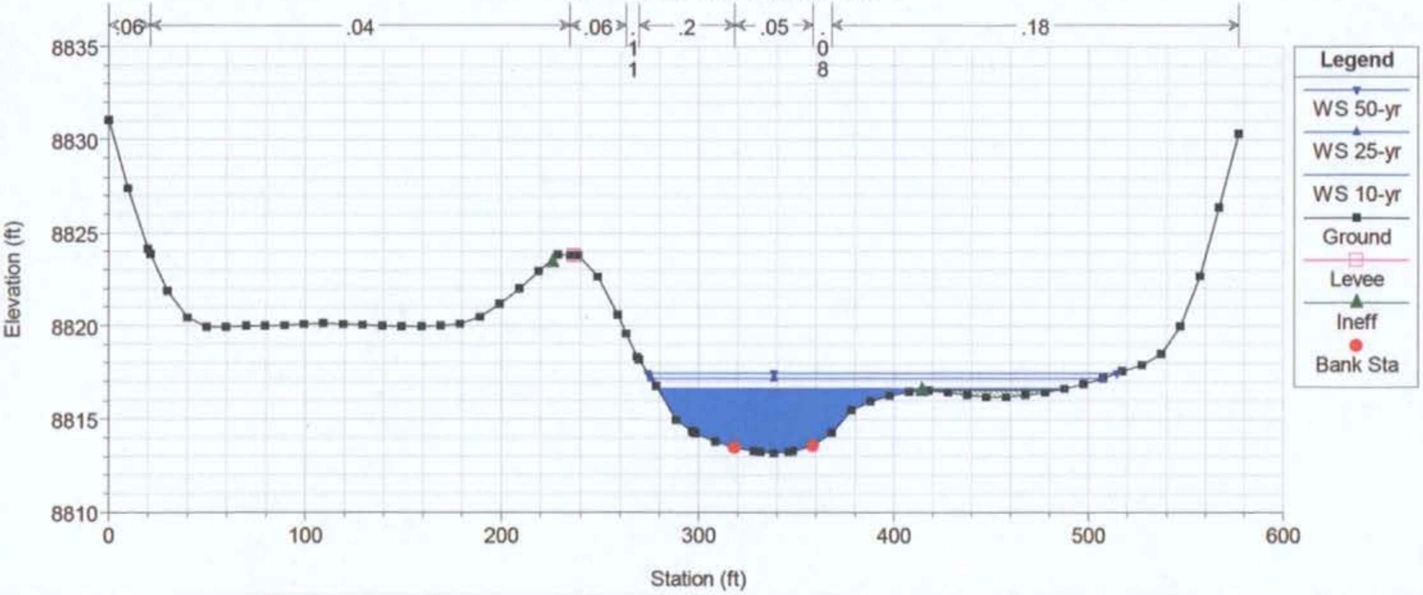
Rico Plan: Final_r5 12/15/2011
RS = 4781.7 Sta 38+26: U/S of Pond 18

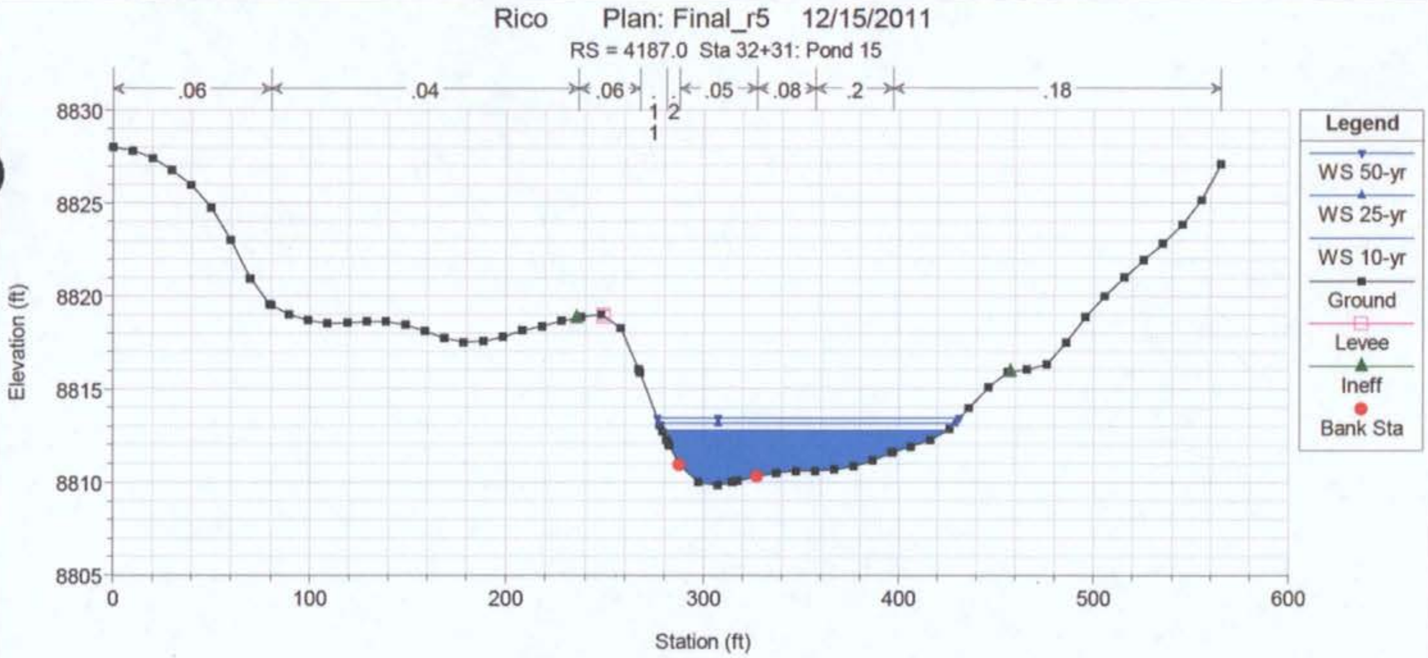


Rico Plan: Final_r5 12/15/2011
RS = 4577.4 Sta 36+21: Pond 18

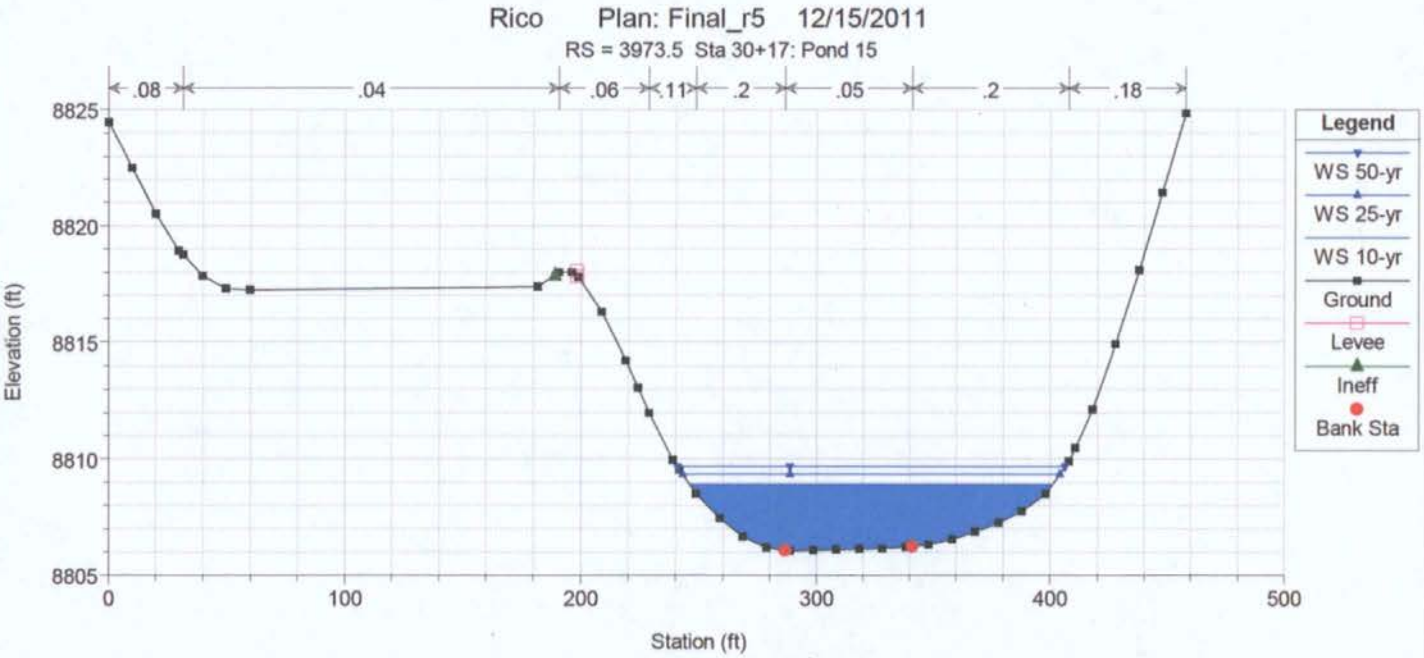


Rico Plan: Final_r5 12/15/2011
RS = 4404.1 Sta 34+48: Pond 18

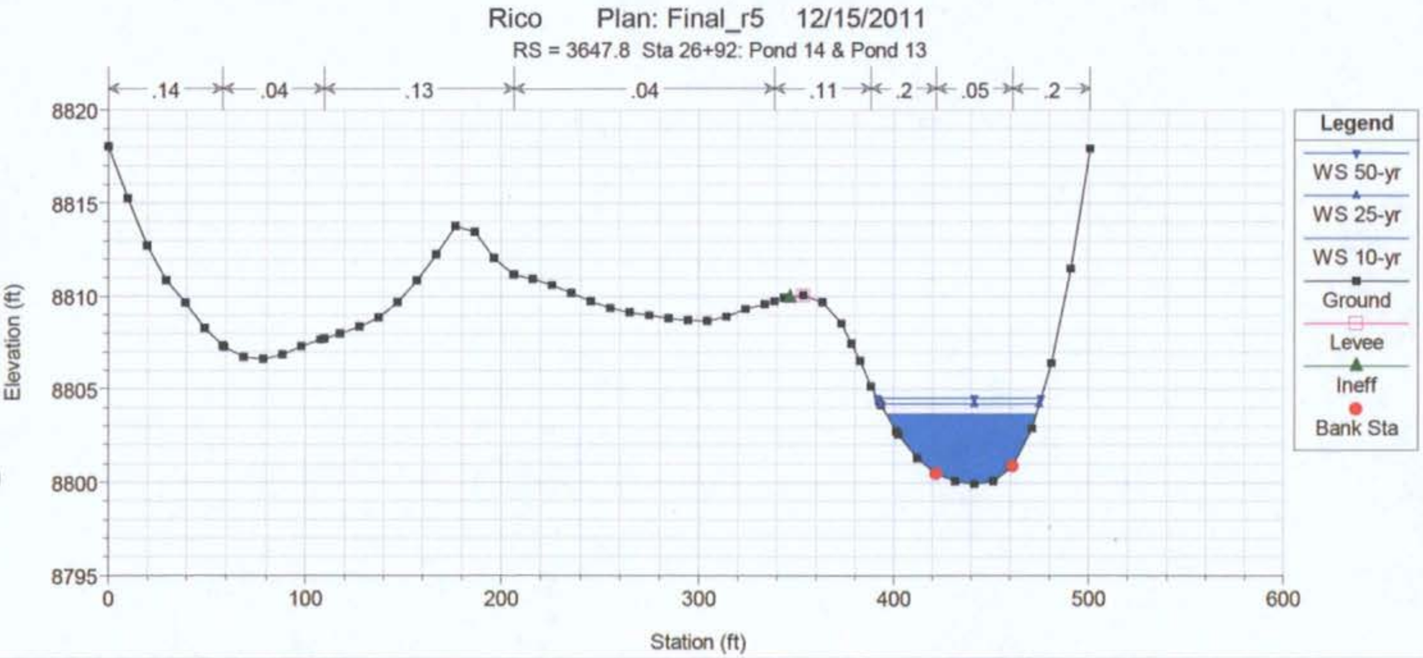



Rico Plan: Final_r5 12/15/2011

RS = 4187.0 Sta 32+31: Pond 15


Rico Plan: Final_r5 12/15/2011

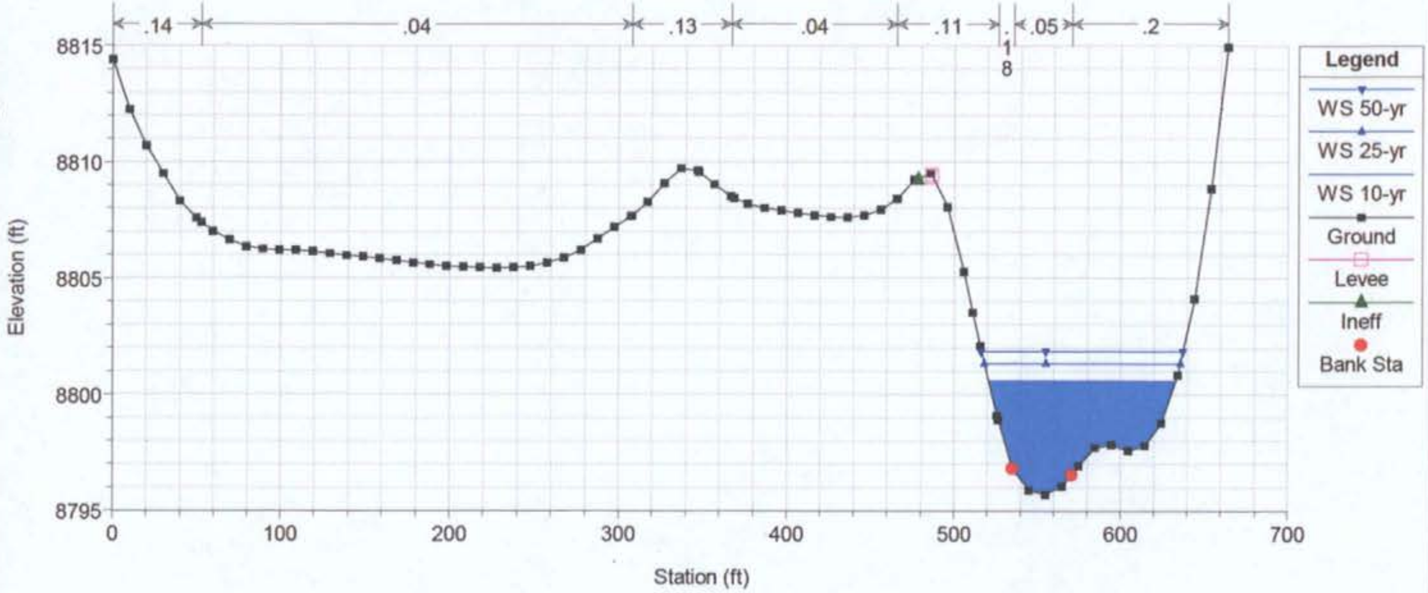
RS = 3973.5 Sta 30+17: Pond 15


Rico Plan: Final_r5 12/15/2011

RS = 3647.8 Sta 26+92: Pond 14 & Pond 13

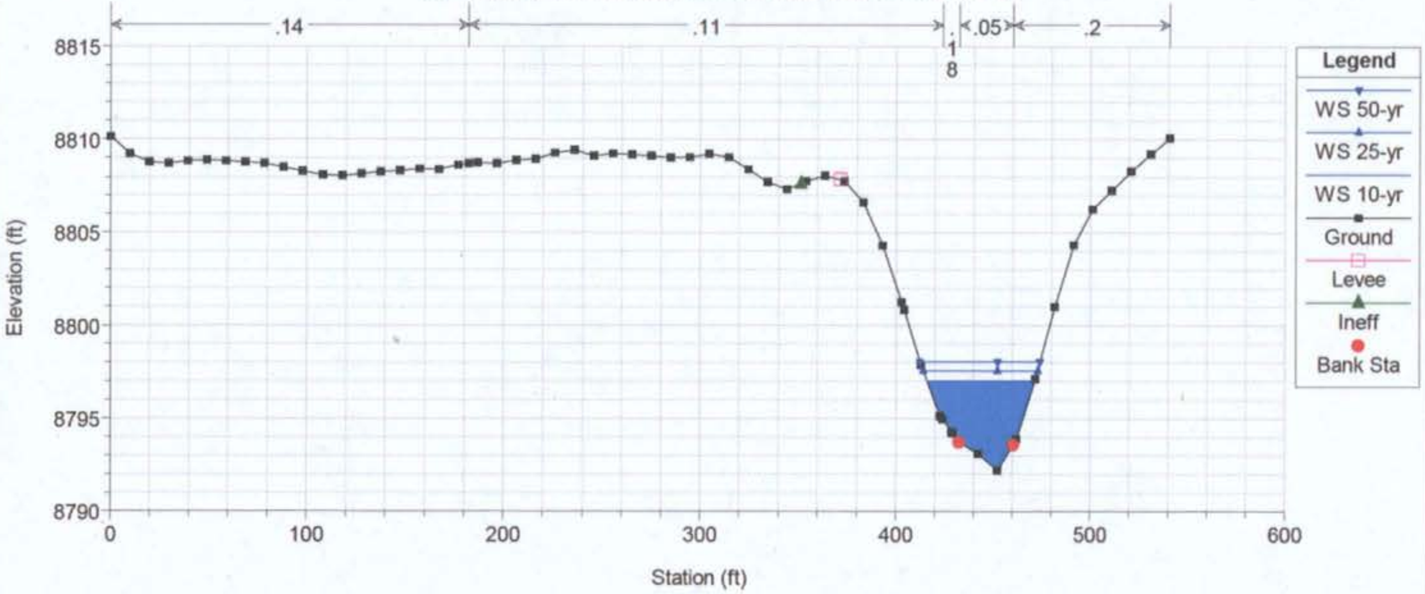
Rico Plan: Final_r5 12/15/2011

RS = 3420.7 Sta 24+65: Pond 12 & Pond 13



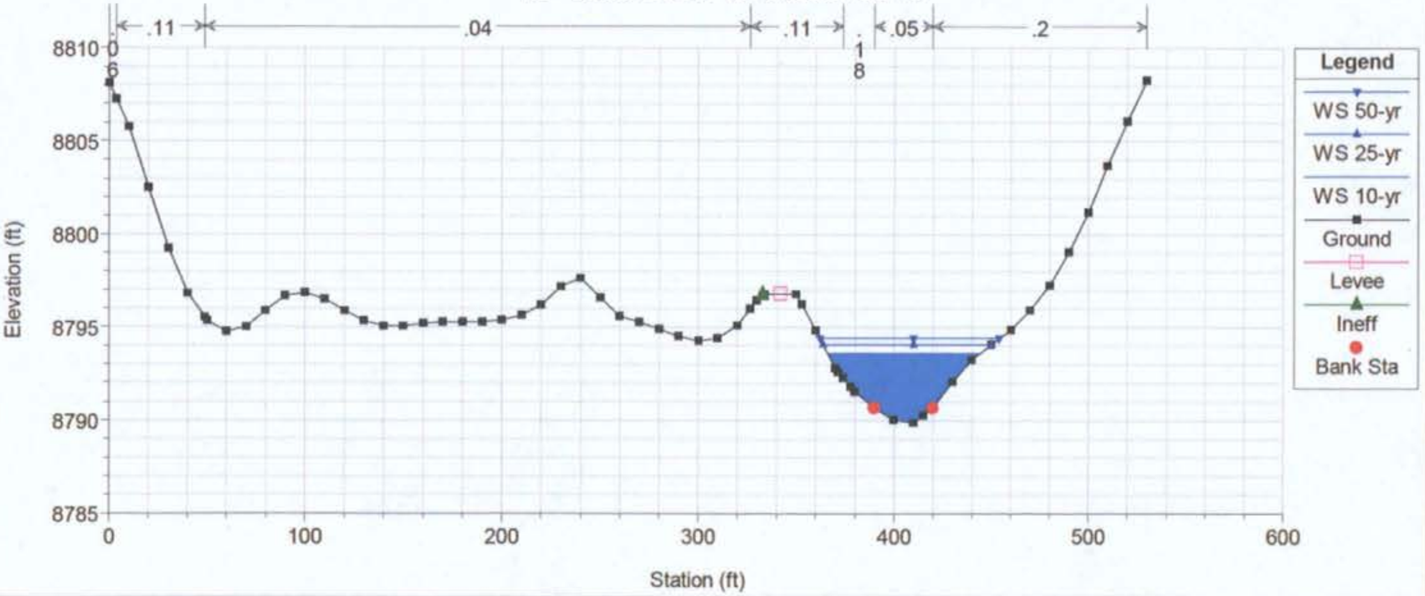
Rico Plan: Final_r5 12/15/2011

RS = 3169.1 Sta 22+13: Dike across south side of Pond 11 & 13



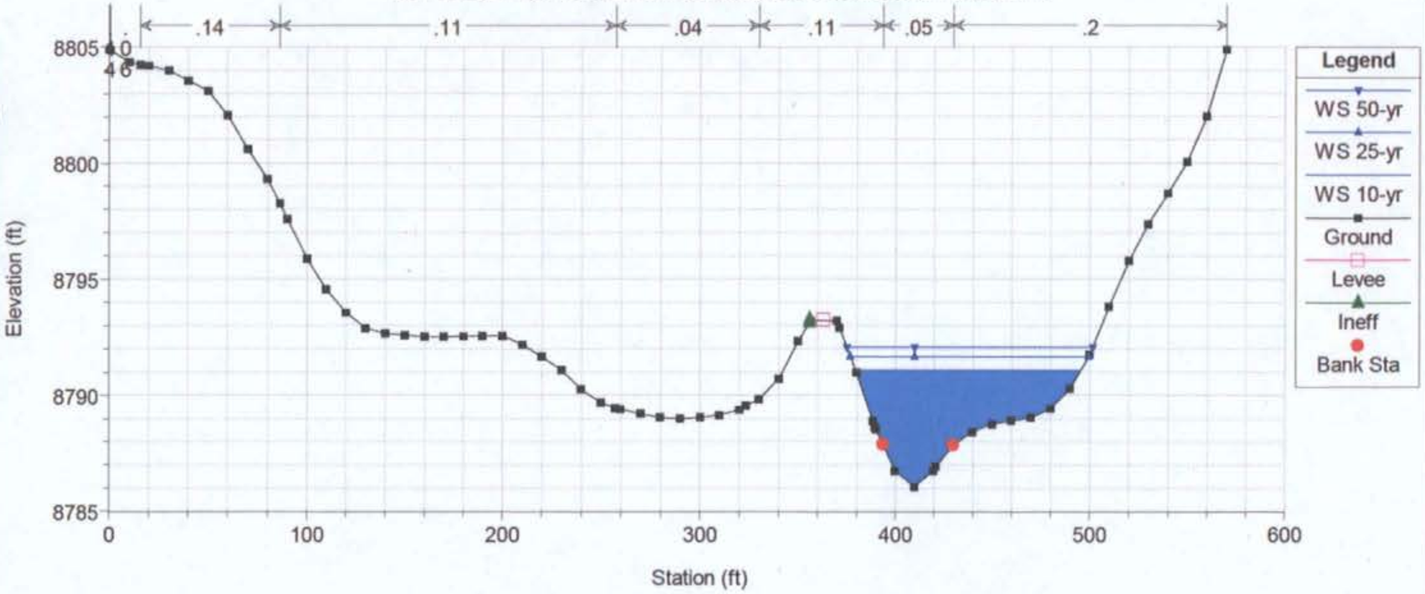
Rico Plan: Final_r5 12/15/2011

RS = 3000.9 Sta 20+45: Pond 9 & Pond 10



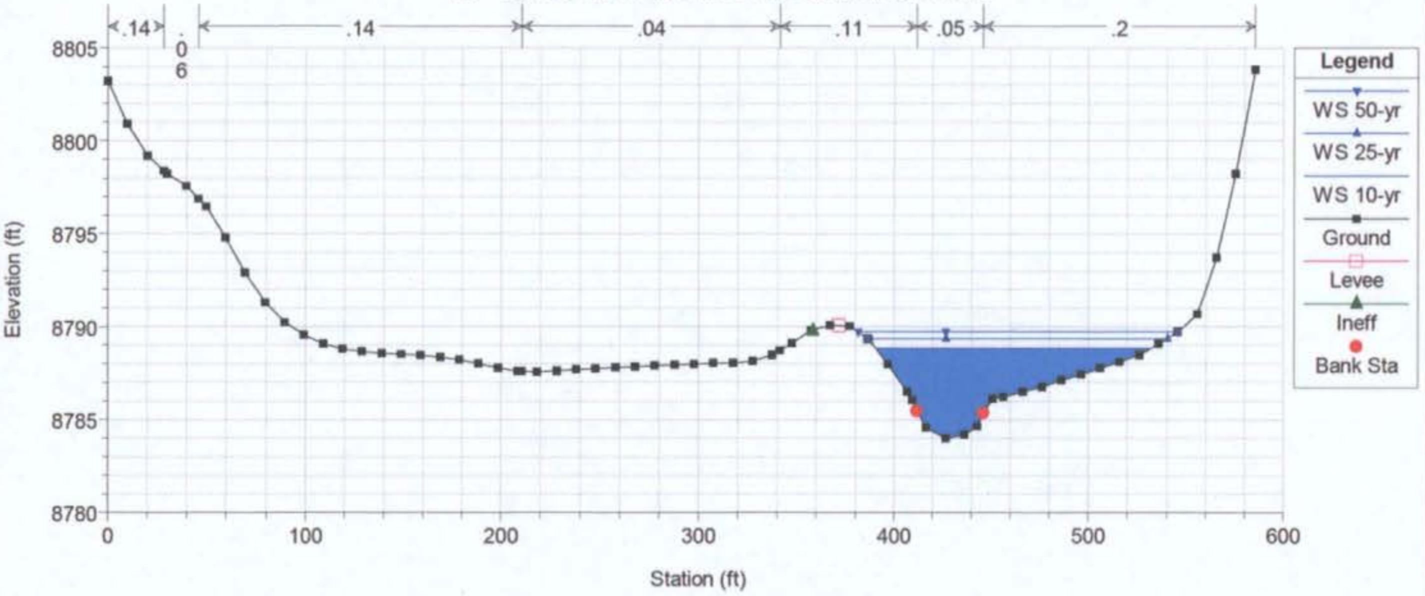
Rico Plan: Final_r5 12/15/2011

RS = 2855.1 Sta 18+99: Pond 8, Dike across south side of Pond 9 & 10



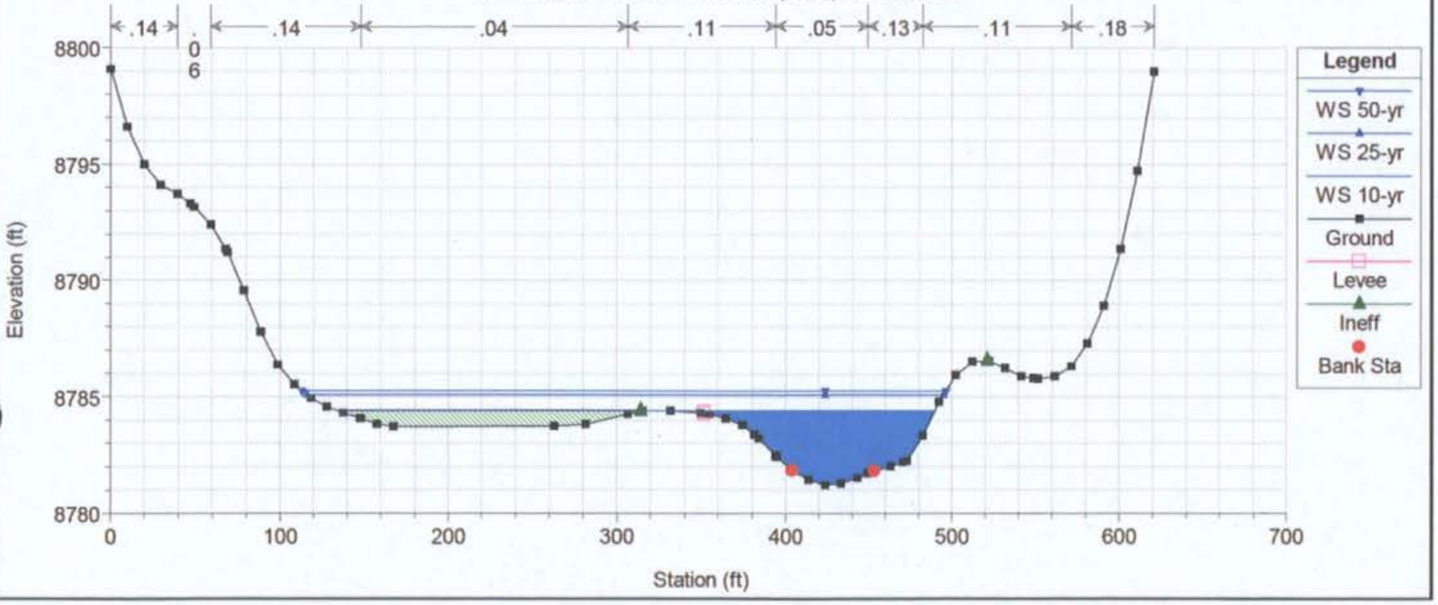
Rico Plan: Final_r5 12/15/2011

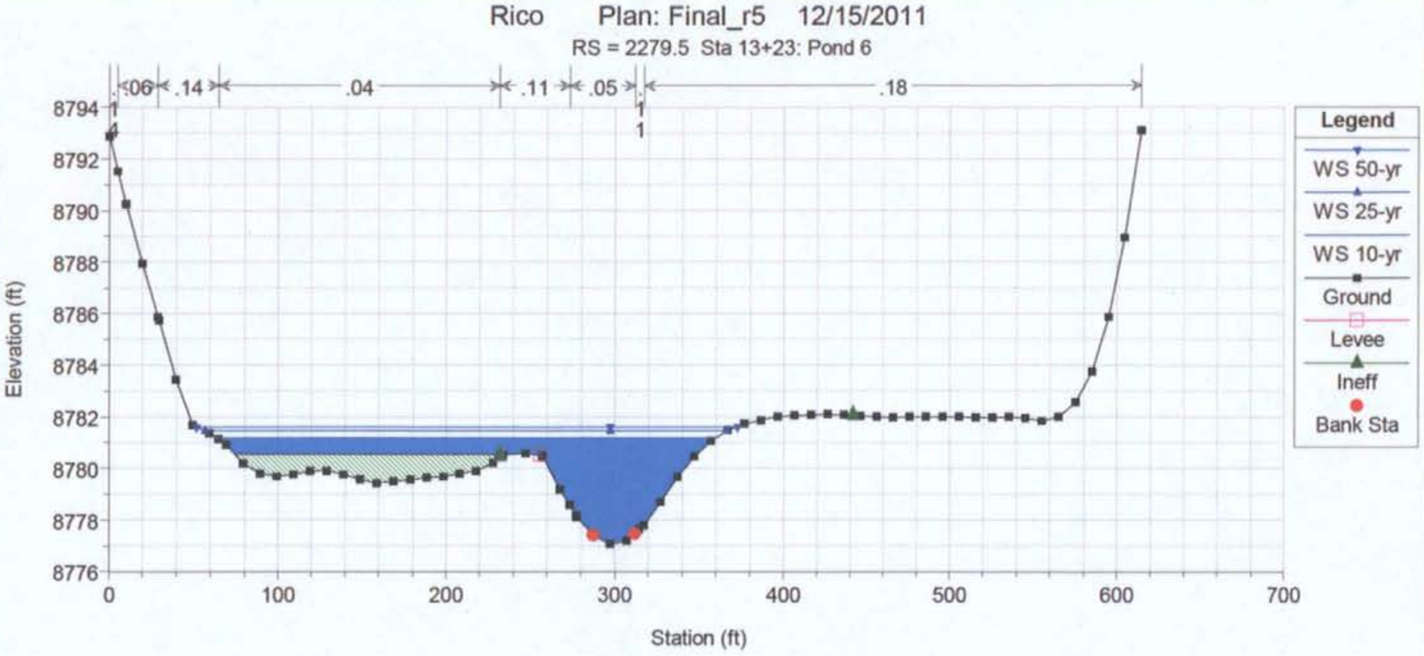
RS = 2712.3 Sta 17+56: Dike across south side of Pond 8

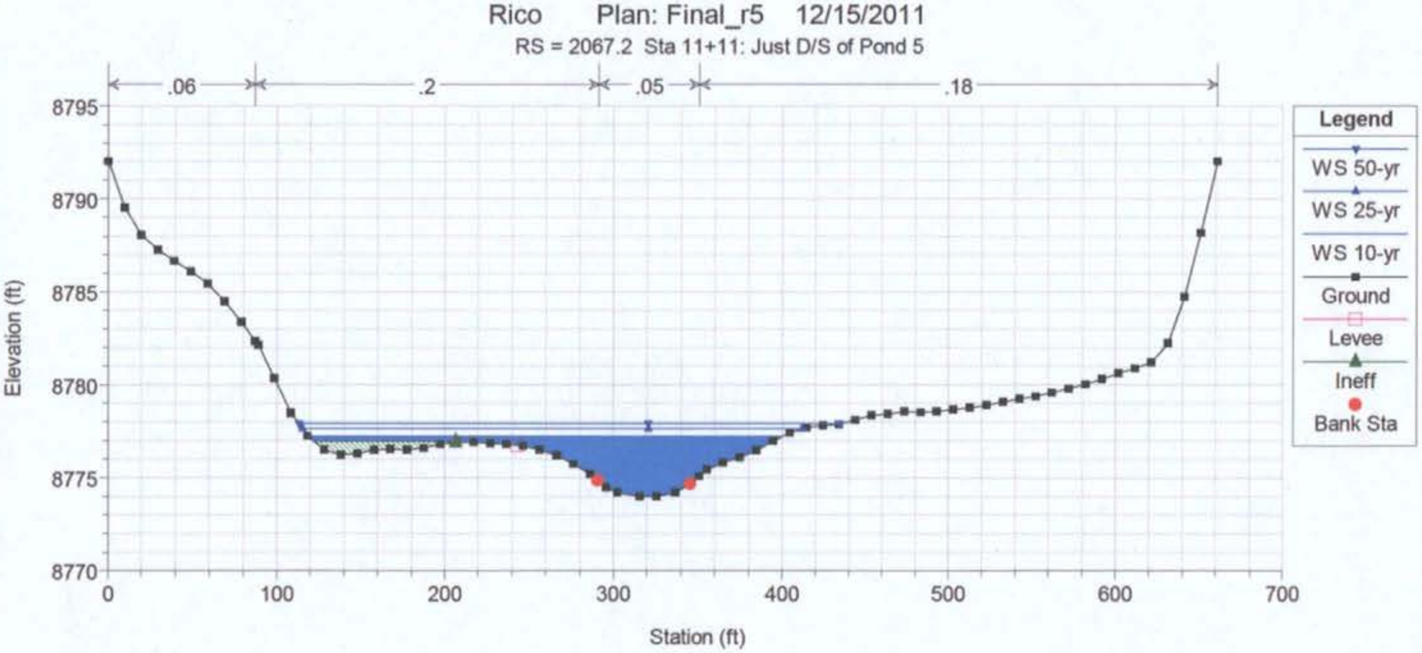


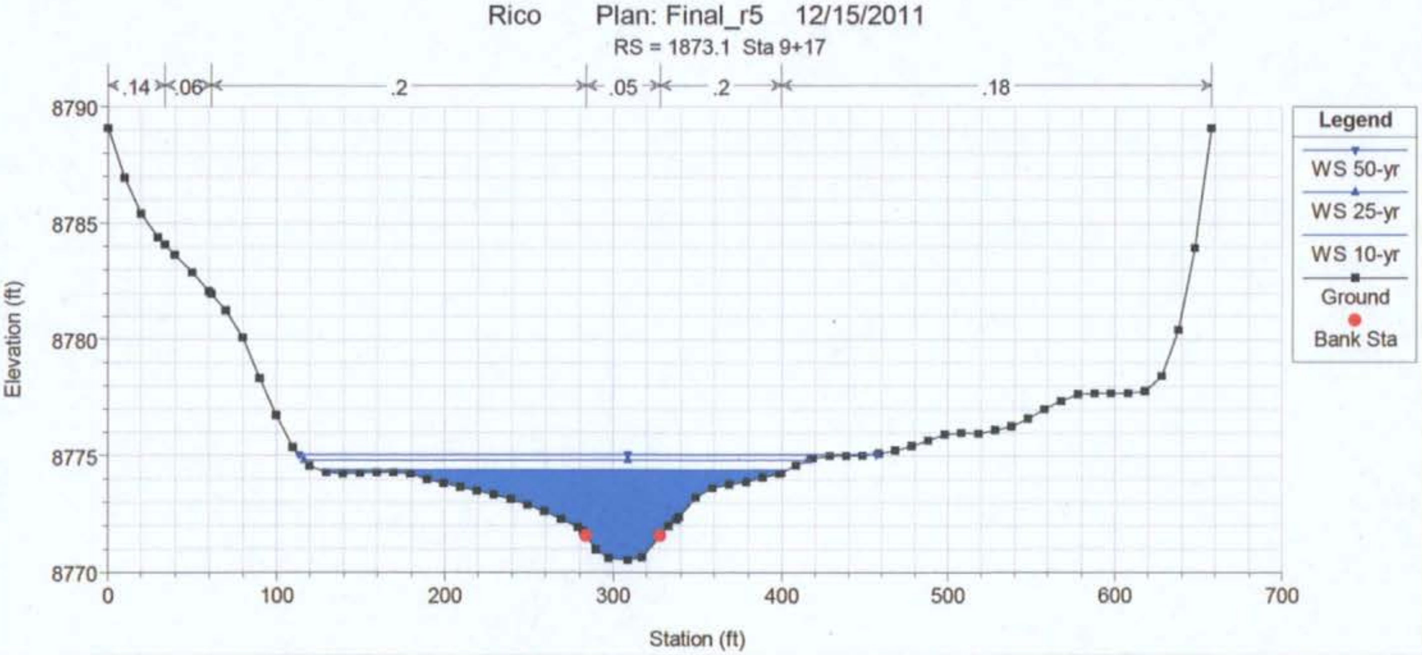
Rico Plan: Final_r5 12/15/2011

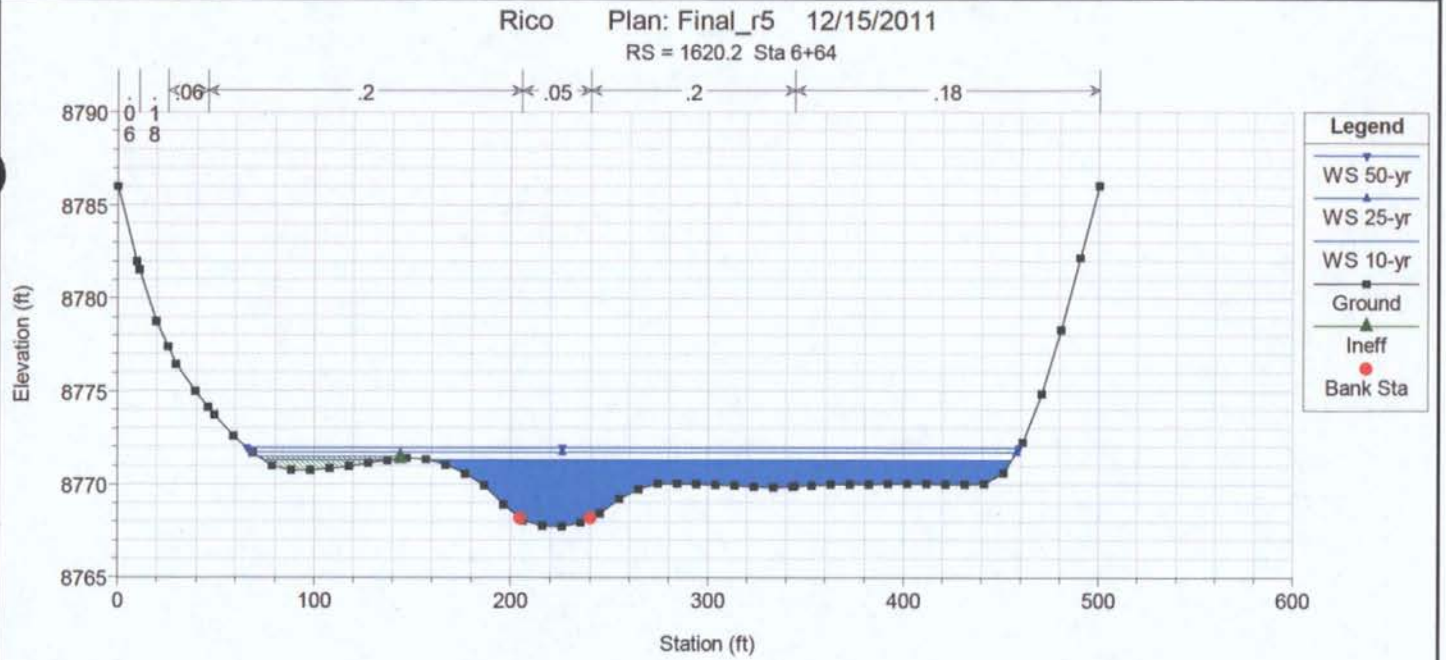
RS = 2468.5 Sta 15+12: Pond 7 just upstream of dike

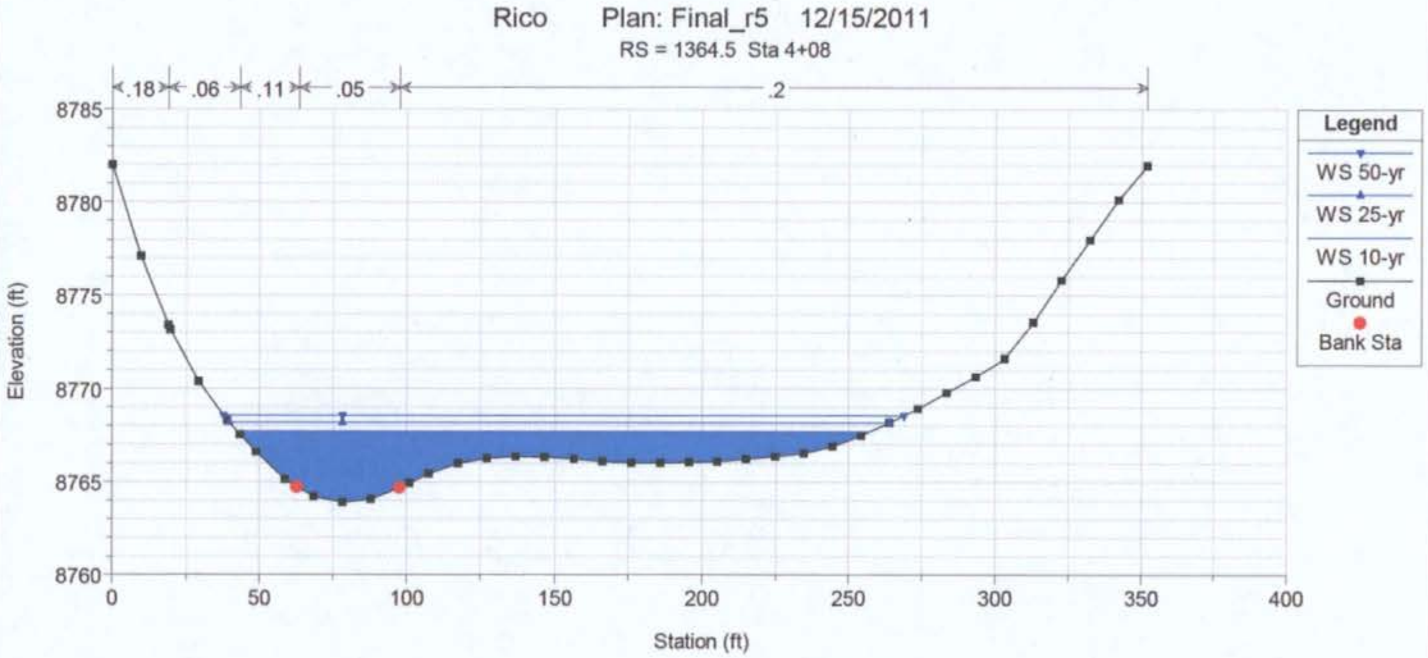


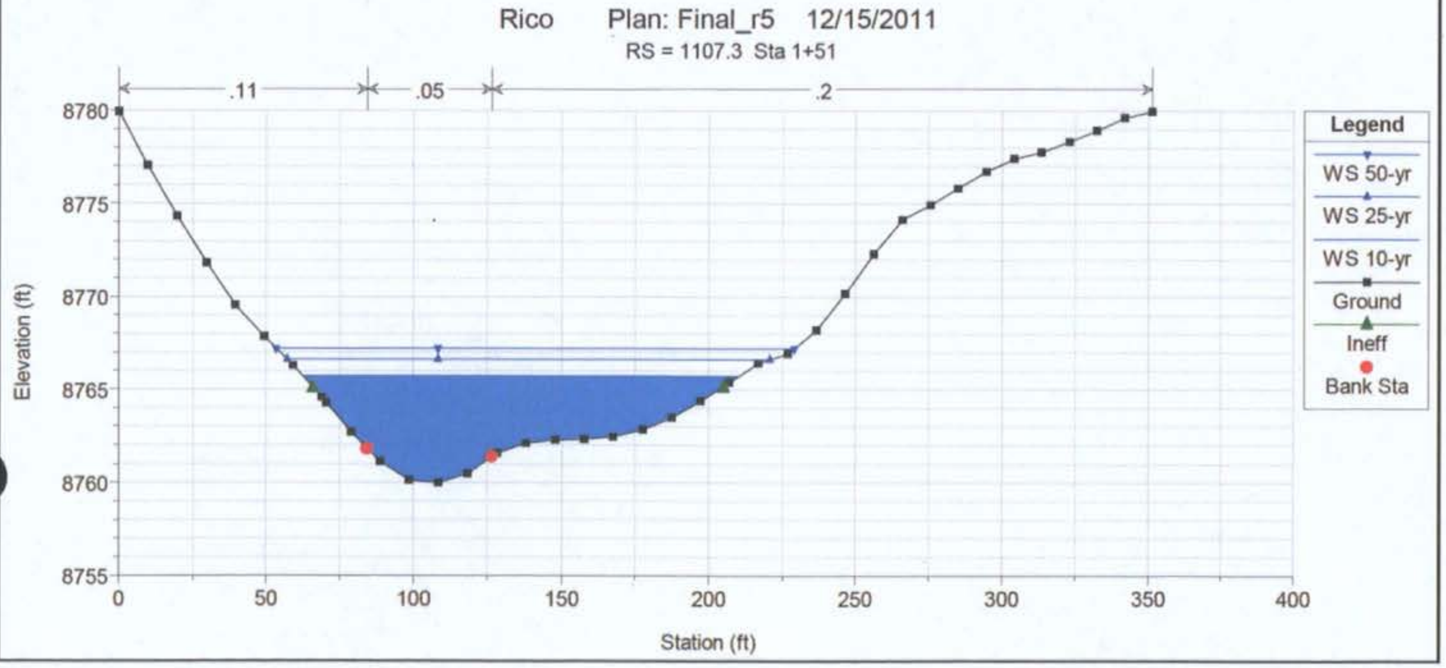

Rico Plan: Final_r5 12/15/2011
RS = 2279.5 Sta 13+23: Pond 6
.06
.14
.04
.11
.05
.18
1
1
Elevation (ft)
8794
8792
8790
8788
8786
8784
8782
8780
8778
8776
0
100
200
300
400
500
600
700
Station (ft)
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Levee
Ineff
Bank Sta

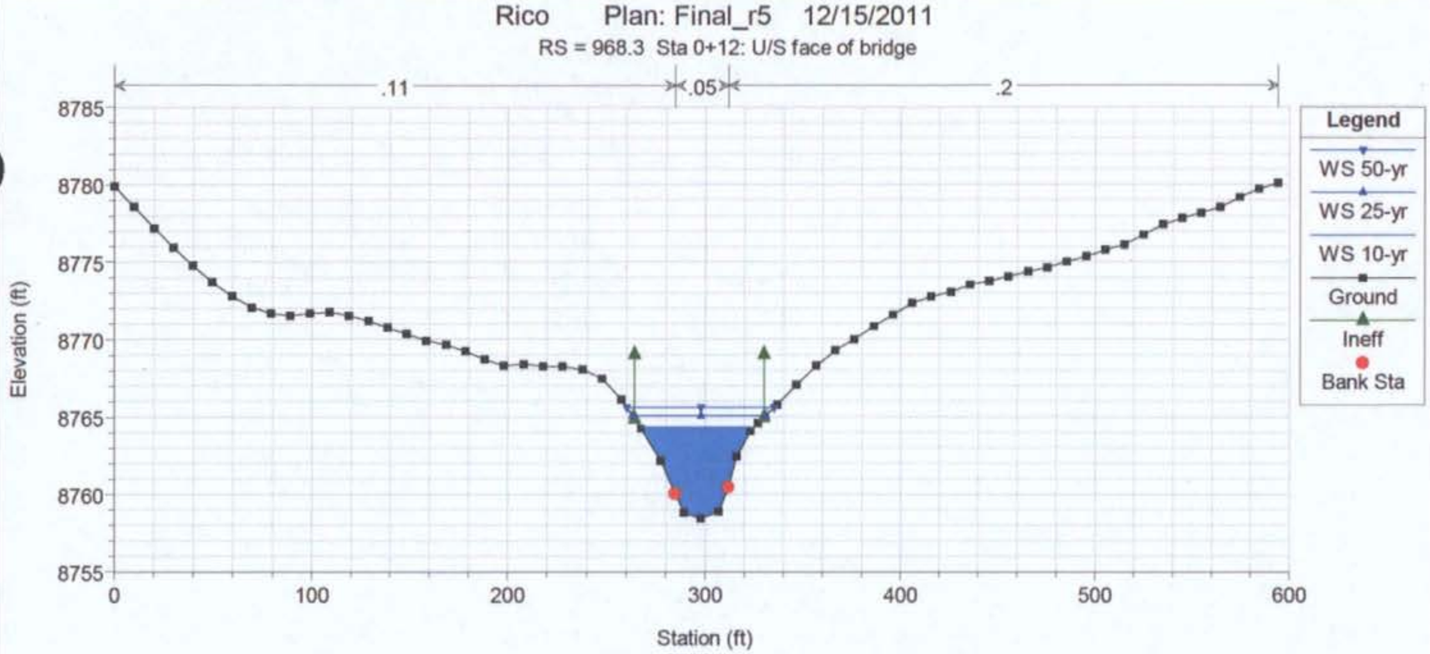

Rico Plan: Final_r5 12/15/2011
RS = 2067.2 Sta 11+11: Just D/S of Pond 5
.06
.2
.05
.18
Elevation (ft)
8795
8790
8785
8780
8775
8770
0
100
200
300
400
500
600
700
Station (ft)
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Levee
Ineff
Bank Sta


Rico Plan: Final_r5 12/15/2011
RS = 1873.1 Sta 9+17
.14
.06
.2
.05
.2
.18
Elevation (ft)
8790
8785
8780
8775
8770
0
100
200
300
400
500
600
700
Station (ft)
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Bank Sta

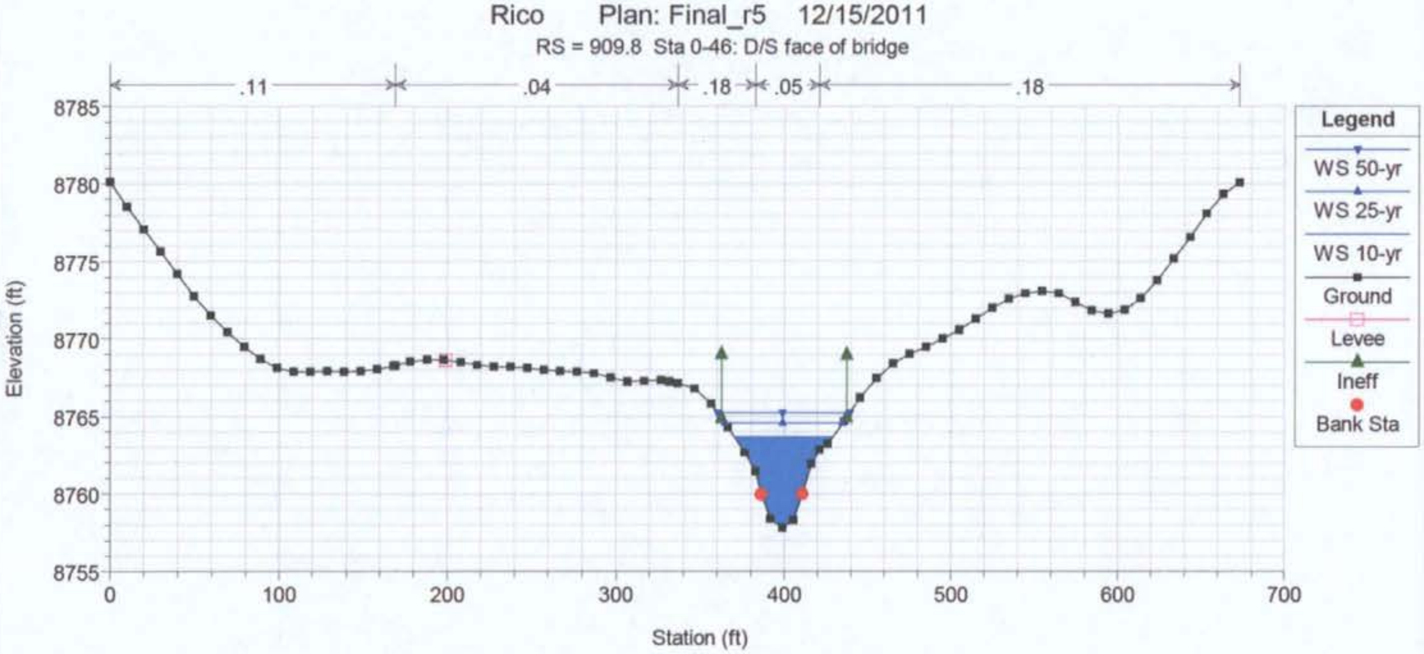

Rico Plan: Final_r5 12/15/2011
RS = 1620.2 Sta 6+64
.06
.2
.05
.2
.18
0 6
1 8
Elevation (ft)
8765
8770
8775
8780
8785
8790
Station (ft)
0
100
200
300
400
500
600
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Ineff
Bank Sta


Rico Plan: Final_r5 12/15/2011
RS = 1364.5 Sta 4+08
.18
.06
.11
.05
.2
Elevation (ft)
8760
8765
8770
8775
8780
8785
Station (ft)
0
50
100
150
200
250
300
350
400
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Bank Sta

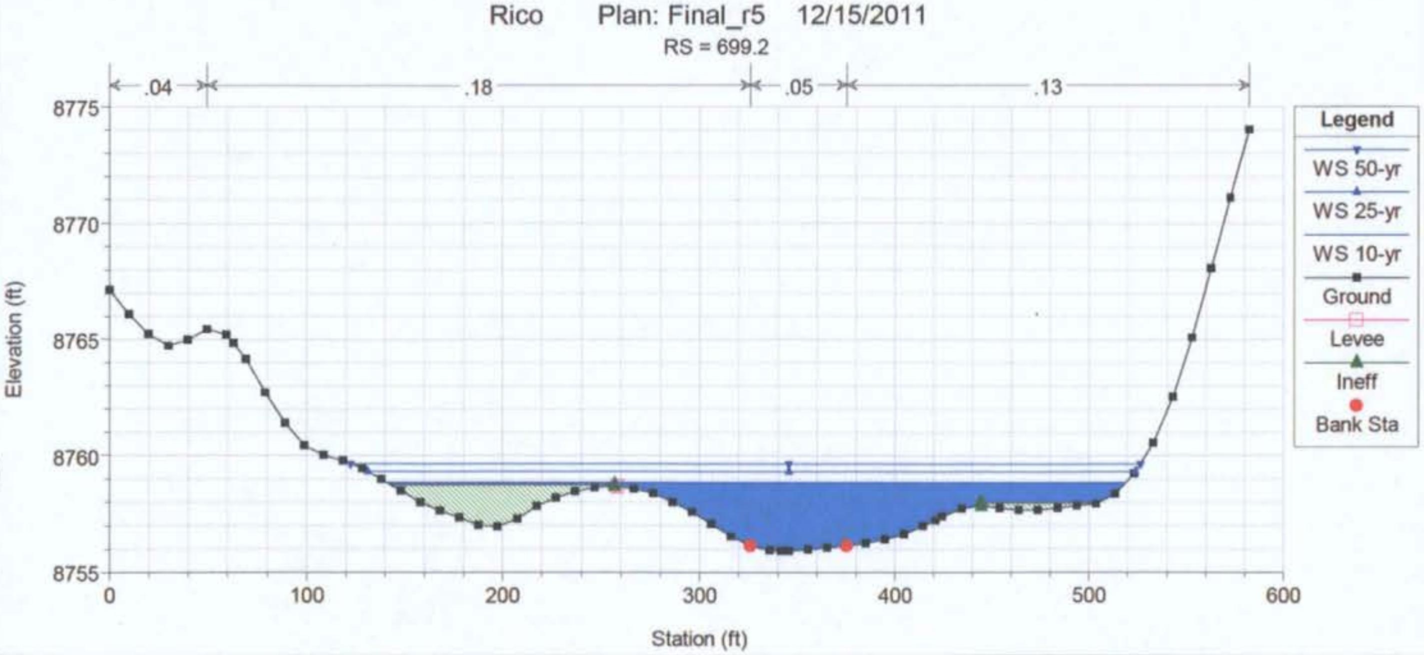

Rico Plan: Final_r5 12/15/2011
RS = 1107.3 Sta 1+51
.11
.05
.2
Elevation (ft)
8755
8760
8765
8770
8775
8780
Station (ft)
0
50
100
150
200
250
300
350
400
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Ineff
Bank Sta


Rico Plan: Final_r5 12/15/2011

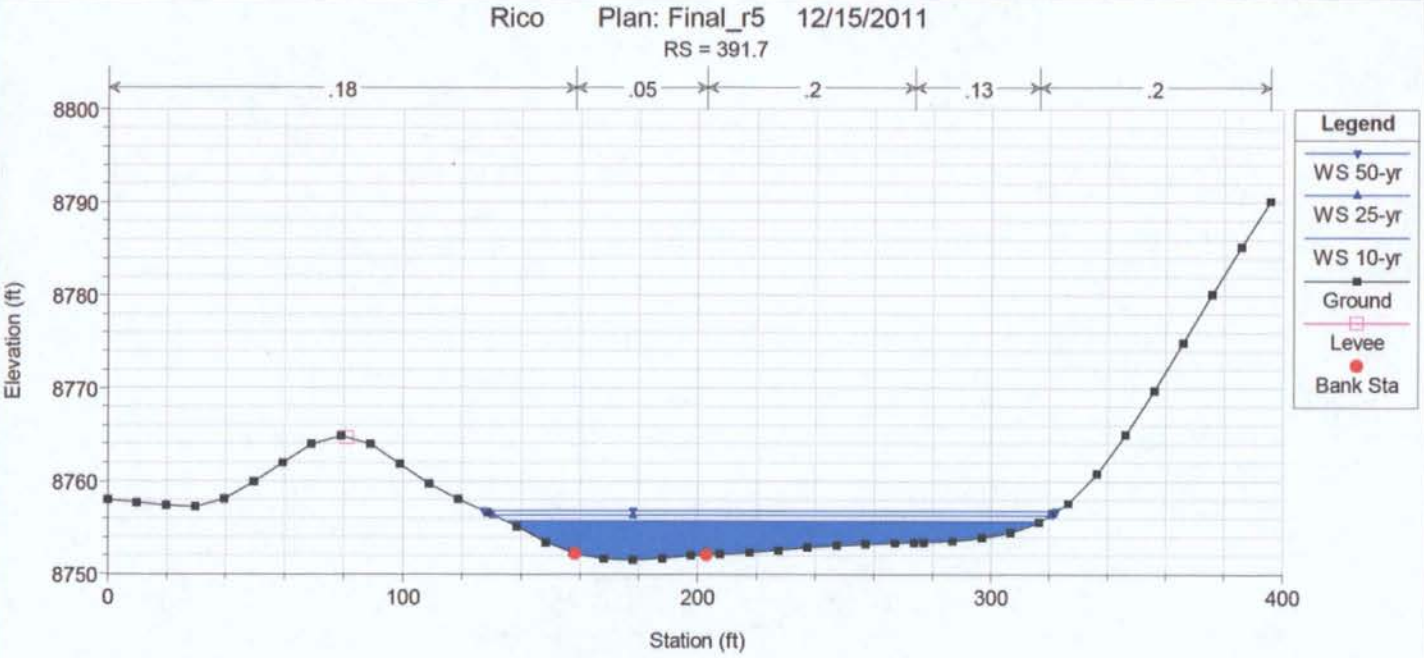
RS = 968.3 Sta 0+12: U/S face of bridge

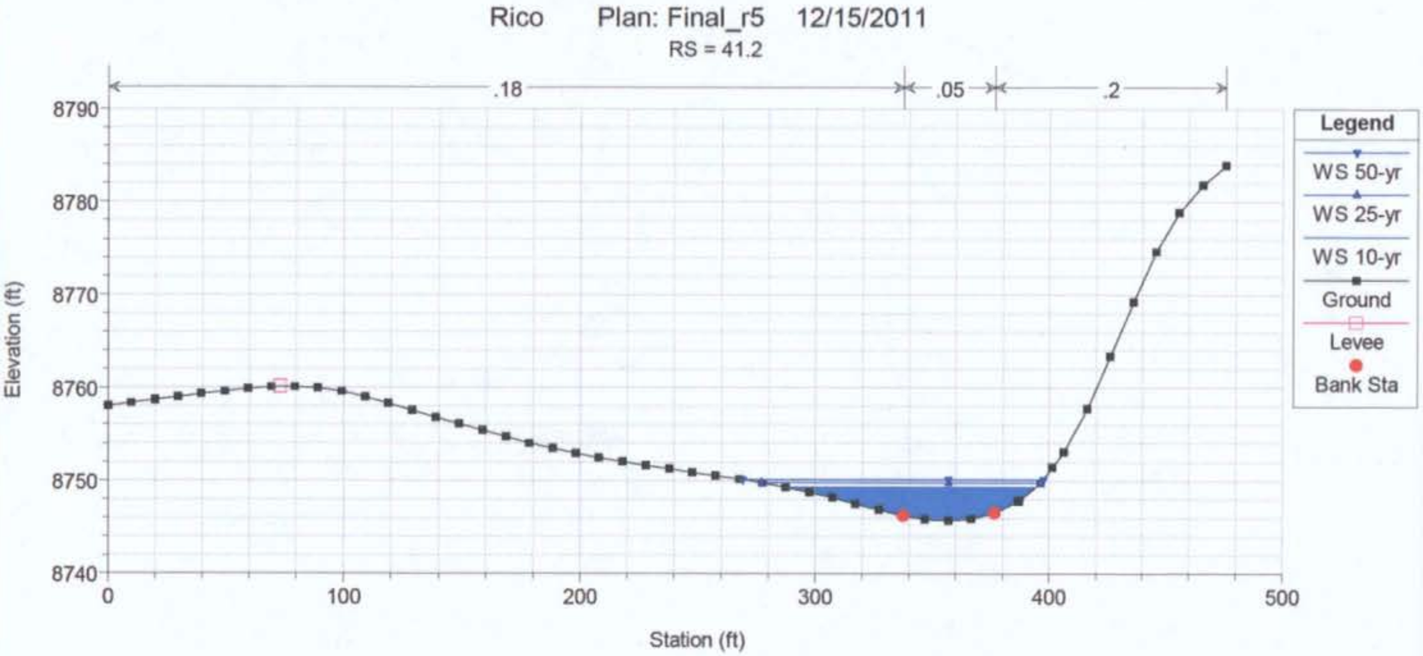

Rico Plan: Final_r5 12/15/2011

RS = 909.8 Sta 0-46: D/S face of bridge


Rico Plan: Final_r5 12/15/2011

RS = 699.2


Rico Plan: Final_r5 12/15/2011
RS = 391.7
.18
.05
.2
.13
.2
8800
8790
8780
8770
8760
8750
Elevation (ft)
0
100
200
300
400
Station (ft)
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Levee
Bank Sta


Rico Plan: Final_r5 12/15/2011
RS = 41.2
.18
.05
.2
8790
8780
8770
8760
8750
8740
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 50-yr
WS 25-yr
WS 10-yr
Ground
Levee
Bank Sta

# APPENDIX B6
# RIPRAP SCOUR CALCULATIONS

Angle of bank in degrees

| Station | Theta(degrees) | Slope H:1V |
|---|---|---|
| 0+00.0 | 30 | 1.7 |
| 19+50.0 | 20 | 2.7 |
| 21+00.0 | 20 | 2.7 |
| 23+72.0 | 30 | 1.7 |
| 26+47.0 | 30 | 1.7 |
| 27+95.0 | 25 | 2.1 |
| 28+61.0 | 30 | 1.7 |
| 31+25.0 | 20 | 2.7 |
| 33+55.0 | 30 | 1.7 |
| 33+65.0 | 35 | 1.4 |
| 35+00.0 | 35 | 1.4 |
| 36+00.0 | 25 | 2.1 |
| 36+50.0 | 42 | 1.1 |
| 41+00.0 | 25 | 2.1 |
| 44+50.0 | 25 | 2.1 |
| 60+00.0 | 25 | 2.1 |

Local Channel Curvature

Channel Type 1 1=Natural, 0=Trapezoidal or any number inbetween

| Station | U/S Station at beginning of bend | Radius | W | R/W | Vratio(Vss / Vavg) | Vratio Dissipation Rate | Cv | Distance U/s to next bend | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 113 | 205 | 40 | 5 | 1.4 | 0.00250 | 1.1 | | | | |
| 113 | 113 | 205 | 40 | 5 | 1.0 | 0.00250 | 1.1 | 141 | | | |
| 153 | 501 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 214 | 501 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 254 | 501 | 367 | 40 | 9 | 1.2 | 0.00250 | 1.1 | | | | |
| 501 | 501 | 367 | 40 | 9 | 1.0 | 0.00250 | 1.1 | 50 | | | |
| 527 | 718 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 527 | 718 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 552 | 718 | -914 | 40 | -23 | 1.0 | 0.00250 | 1.0 | | | | |
| 718 | 718 | -914 | 40 | -23 | 1.0 | 0.00250 | 1.0 | 82 | | | |
| 758 | 1076 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 760 | 1076 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 800 | 1076 | -664 | 40 | -17 | 1.0 | 0.00250 | 1.0 | | | | |
| 1076 | 1076 | -664 | 40 | -17 | 1.0 | 0.00250 | 1.0 | 114 | | | |
| 1116 | 1358 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 1150 | 1358 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 1190 | 1358 | 438 | 40 | 11 | 1.2 | 0.00250 | 1.1 | | | | |
| 1358 | 1358 | 438 | 40 | 11 | 1.0 | 0.00250 | 1.1 | 59 | | | |
| 1388 | 1618 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 1388 | 1618 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 1418 | 1618 | -427 | 40 | -11 | 1.0 | 0.00250 | 1.0 | | | | |
| 1618 | 1618 | -427 | 40 | -11 | 1.0 | 0.00250 | 1.0 | 231 | | | |
| 1658 | 2269 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 1809 | 2269 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 1849 | 2269 | 470 | 40 | 12 | 1.2 | 0.00250 | 1.1 | | | | |
| 2269 | 2269 | 470 | 40 | 12 | 1.0 | 0.00250 | 1.1 | 0 | | | |
| 2269 | 2503 | 9999 | 40 | 250 | 1.0 | | 1.1 | | | | |
| 2270 | 2503 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 2270 | 2503 | -1272 | 40 | -32 | 1.0 | 0.00250 | 1.0 | | | | |
| 2503 | 2503 | -1272 | 40 | -32 | 1.0 | 0.00250 | 1.0 | 459 | | | |
| 2543 | 3099 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 2922 | 3099 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 2962 | 3099 | -355 | 40 | -9 | 1.0 | 0.00250 | 1.0 | | | | |
| 3099 | 3099 | -355 | 40 | -9 | 1.0 | 0.00250 | 1.0 | 152 | | | |
| 3139 | 3415 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 3211 | 3415 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 3251 | 3415 | 517 | 40 | 13 | 1.2 | 0.00250 | 1.1 | | | | |
| 3415 | 3415 | 517 | 40 | 13 | 1.0 | 0.00250 | 1.1 | 91 | | | |
| 3455 | 3608 | 9999 | 40 | 250 | 1.1 | | 1.0 | | | | |
| 3466 | 3608 | 9999 | 40 | 250 | 1.1 | | 1.0 | | | | |
| 3506 | 3608 | 433 | 40 | 11 | 1.2 | 0.00250 | 1.1 | | | | |
| 3608 | 3608 | 433 | 40 | 11 | 1.0 | 0.00250 | 1.1 | 0 | | | |
| 3608 | 3666 | 9999 | 40 | 250 | 1.0 | | 1.1 | | | | |
| 3608 | 3666 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 3608 | 3666 | -182 | 40 | -5 | 1.0 | 0.00250 | 1.0 | | | | |
| 3666 | 3666 | -182 | 40 | -5 | 1.0 | 0.00250 | 1.0 | 34 | | | |
| 3683 | 3975 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 3683 | 3975 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 3700 | 3975 | -700 | 40 | -18 | 1.0 | 0.00250 | 1.0 | | 3832 | 4043 | -241 |
| 3975 | 3975 | -700 | 40 | -18 | 1.1 | 0.00250 | 1.0 | 5 | | | |
| 3977 | 4660 | 9999 | 40 | 250 | 1.1 | | 1.0 | | | | |
| 3978 | 4660 | 9999 | 40 | 250 | 1.1 | | 1.0 | | | | |
| 3980 | 4660 | 600 | 40 | 15 | 1.1 | 0.00250 | 1.0 | | 4358 | 4642 | 289 |
| 4660 | 4660 | 600 | 40 | 15 | 1.0 | 0.00250 | 1.0 | 202 | | | |
| 4700 | 4970 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 4822 | 4970 | 9999 | 40 | 250 | 1.0 | | 1.0 | | | | |
| 4862 | 4970 | 9999 | 40 | 250 | 1.0 | 0.00250 | 1.0 | | 4862 | 4970 | -200 |
| 4970 | 4970 | 9999 | 40 | 250 | 1.1 | 0.00250 | 1.0 | 0 | | | |
| 4970 | 5213 | 9999 | 40 | 250 | 1.1 | | 1.0 | | | | |
| 4970 | 5213 | 9999 | 40 | 250 | 1.1 | | 1.0 | | | | |

|  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| 4970 | 5213 | 627 | 40 | 16 | 1.1 | 0.00250 | 1.0 |  |
| 5213 | 5213 | 627 | 40 | 16 | 1.0 | 0.00250 | 1.0 | -5213 |

Total Channel Curvature

Channel Type 1 1=Natural, 0=Trapezoidal or any number inbetween

| Station | U/S Station at beginning of bend | Radius | W | R/W | Vratio(Vss / Vavg) | Vratio Dissipation Rate | Cv | Distance U/s to next bend |
|---|---|---|---|---|---|---|---|---|
| 0 | 113 | 205 | 84 | 2.4 | 1.5 | 0.00119 | 1.2 | |
| 113 | 113 | 205 | 157 | 1.3 | 1.5 | 0.00064 | 1.3 | 141 |
| 184 | 501 | | 192 | | 1.6 | | 1.2 | |
| 184 | 501 | | 192 | | 1.6 | | 1.2 | |
| 254 | 501 | 367 | 206 | 1.8 | 1.6 | 0.00048 | 1.2 | |
| 501 | 501 | 367 | 297 | 1.2 | 1.0 | 0.00034 | 1.3 | 50 |
| 527 | 718 | | 312 | | 1.0 | | 1.3 | |
| 527 | 718 | | 312 | | 1.0 | | 1.0 | |
| 552 | 718 | -914 | 328 | -2.8 | 1.0 | 0.00030 | 1.0 | |
| 718 | 718 | -914 | 391 | -2.3 | 1.0 | 0.00026 | 1.0 | 82 |
| 759 | 1076 | | 385 | | 1.0 | | 1.0 | |
| 759 | 1076 | | 385 | | 1.0 | | 1.0 | |
| 800 | 1076 | -664 | 379 | -1.8 | 1.0 | 0.00026 | 1.0 | |
| 1076 | 1076 | -664 | 342 | -1.9 | 1.6 | 0.00029 | 1.0 | 114 |
| 1133 | 1358 | | 337 | | 1.7 | | 1.0 | |
| 1133 | 1358 | | 337 | | 1.7 | | 1.2 | |
| 1190 | 1358 | 438 | 336 | 1.3 | 1.7 | 0.00030 | 1.3 | |
| 1358 | 1358 | 438 | 345 | 1.3 | 1.0 | 0.00029 | 1.3 | 59 |
| 1388 | 1618 | | 353 | | 1.0 | | 1.3 | |
| 1388 | 1618 | | 353 | | 1.0 | | 1.0 | |
| 1418 | 1618 | -427 | 362 | -1.2 | 1.0 | 0.00028 | 1.0 | |
| 1618 | 1618 | -427 | 293 | -1.5 | 1.3 | 0.00034 | 1.0 | 231 |
| 1734 | 2269 | | 187 | | 1.4 | | 1.0 | |
| 1734 | 2269 | | 187 | | 1.4 | | 1.1 | |
| 1849 | 2269 | 470 | 143 | 3.3 | 1.5 | 0.00070 | 1.2 | |
| 2269 | 2269 | 470 | 78 | 6.0 | 1.0 | 0.00128 | 1.1 | 0 |
| 2269 | 2503 | | 78 | | 1.0 | | 1.1 | |
| 2270 | 2503 | | 78 | | 1.0 | | 1.0 | |
| 2270 | 2503 | -1272 | 78 | -16.3 | 1.0 | 0.00128 | 1.0 | |
| 2503 | 2503 | -1272 | 118 | -10.7 | 1.0 | 0.00084 | 1.0 | 459 |
| 2621 | 3099 | | 99 | | 1.0 | | 1.0 | |
| 2806 | 3099 | | 116 | | 1.0 | | 1.0 | |
| 2962 | 3099 | -355 | 156 | -2.3 | 1.0 | 0.00064 | 1.0 | |
| 3099 | 3099 | -355 | 165 | -2.1 | 1.4 | 0.00060 | 1.0 | 152 |
| 3175 | 3415 | | 161 | | 1.4 | | 1.0 | |
| 3175 | 3415 | | 161 | | 1.4 | | 1.1 | |
| 3251 | 3415 | 517 | 167 | 3.1 | 1.5 | 0.00060 | 1.2 | |
| 3415 | 3415 | 517 | 237 | 2.2 | 1.6 | 0.00042 | 1.2 | 91 |
| 3461 | 3608 | | 252 | | 1.6 | | 1.2 | |
| 3461 | 3608 | | 252 | | 1.6 | | 1.2 | |
| 3506 | 3608 | 433 | 258 | 1.7 | 1.6 | 0.00039 | 1.2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3608 | 3608 | 433 | 272 | 1.6 | 1.0 | 0.00037 | 1.2 | 0 |
| 3608 | 3666 | | 272 | | 1.0 | | 1.2 | |
| 3608 | 3666 | | 272 | | 1.0 | | 1.0 | |
| 3608 | 3666 | -182 | 272 | -0.7 | 1.0 | 0.00037 | 1.0 | |
| 3666 | 3666 | -182 | 297 | -0.6 | 1.0 | 0.00034 | 1.0 | 166 |
| 3749 | 4043 | | 340 | | 1.0 | | 1.0 | |
| 3749 | 4043 | | 340 | | 1.0 | | 1.0 | |
| 3832 | 4043 | -241 | 377 | -0.6 | 1.0 | 0.00027 | 1.0 | |
| 4043 | 4043 | -241 | 273 | -0.9 | 1.4 | 0.00037 | 1.0 | 315 |
| 4201 | 4642 | | 230 | | 1.5 | | 1.0 | |
| 4201 | 4642 | | 230 | | 1.5 | | 1.1 | |
| 4358 | 4642 | 289 | 169 | 1.7 | 1.6 | 0.00059 | 1.2 | |
| 4642 | 4642 | 289 | 141 | 2.0 | 1.0 | 0.00071 | 1.2 | 220 |
| 4752 | 4970 | | 191 | | 1.0 | | 1.1 | |
| 4752 | 4970 | | 191 | | 1.0 | | 1.0 | |
| 4862 | 4970 | -200 | 224 | -0.9 | 1.0 | 0.00045 | 1.0 | |
| 4970 | 4970 | -200 | 162 | -1.2 | 1.4 | 0.00062 | 1.0 | 0 |
| 4970 | 5213 | | 162 | | 1.4 | | 1.0 | |
| 4970 | 5213 | | 162 | | 1.4 | | 1.2 | |
| 4970 | 5213 | 627 | 162 | 3.9 | 1.4 | 0.00062 | 1.2 | |
| 5213 | 5213 | 627 | 125 | 5.0 | 1.0 | 0.00080 | 1.1 | -5213 |

Safety Factor 1 1.1 = standard; consider larger values if ice or debris impact or uncertainty in design variables
Begin Station 1100 ft
End Station 4750 ft
Channel Length 3650 ft
Channel Type 1 1=Natural, 0=Trapezoidal or any number inbetween
g 32.2 ft/s^2

| | | | |
|---|---|---|---|
| Pavement depth | | 2 | 1 |
| Cohesive limit vel | | 6 | 6 |
| Bed size (in) | 6 | | 3 |

| | Local Channel | | | | Total Channel | | | | | | | | | | | Riprap Properties | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Station at Upstream end of bend | Vratio(Vss/Vavg) | Vavg Average Velocity (ft/s) | Vss (ft/s) | Station at Upstream end of bend | Vratio(Vss/Vavg) | Vavg Average Velocity (ft/s) | Vss (ft/s) | Water Surface Elevation (ft) | Min Channel Elevation (ft) | Riprap Analysis Elevation (ft) | Local Depth of Flow (ft) | Channel Slope (%) | Bank Angle (degrees) | Channel Velocity (ft/s) | Riprap Angularity | Specific Gravity | Stability Coefficient (Cs) | Ct | Velocity Distribution Coeff (Cv) | Vdesign (ft/s) | Side Slope Correction Factor (K1) | Steep Slop D30 | ishbash D30 | d30 (in) | d50(in) | Scour | MaxScour | Scour El | Scour | MaxScour | Scour El |
| 1100 | 1244 | 1.0 | 7.7 | 7.7 | 1194 | 1.7 | 3.5 | 6.1 | 8778.0 | 8774 | 8774 | 4.2 | 2.3% | 24 | 7.7 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.7 | 0.91 | 9.27 | 0.0 | 9.3 | 11.1 | 0.0 | 0.0 | 8773.8 | 0.0 | 0.0 | 8773.8 |
| 1137 | 1358 | 1.0 | 7.6 | 7.6 | 1358 | 1.7 | 3.5 | 6.2 | 8778.6 | 8774 | 8774 | 4.3 | 2.3% | 24 | 7.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.6 | 0.91 | 9.17 | 0.0 | 9.2 | 11.0 | 0.0 | 0.0 | 8774.4 | 0.0 | 0.0 | 8774.4 |
| 1173 | 1358 | 1.1 | 7.5 | 7.6 | 1358 | 1.7 | 3.6 | 6.2 | 8779.2 | 8775 | 8775 | 4.3 | 2.2% | 24 | 7.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.6 | 0.91 | 8.92 | 0.0 | 8.9 | 10.7 | 0.0 | 0.0 | 8774.9 | 0.0 | 0.0 | 8774.9 |
| 1210 | 1358 | 1.2 | 7.4 | 8.0 | 1358 | 1.6 | 3.6 | 5.9 | 8779.9 | 8775 | 8775 | 4.4 | 2.0% | 24 | 7.4 | Angular | 2.65 | 0.3 | 1 | 1.1 | 8.0 | 0.92 | 8.66 | 0.0 | 8.7 | 10.4 | 0.0 | 0.0 | 8775.4 | 0.0 | 0.0 | 8775.4 |
| 1246 | 1358 | 1.1 | 7.3 | 7.7 | 1358 | 1.5 | 3.7 | 5.4 | 8780.5 | 8776 | 8776 | 4.5 | 1.9% | 24 | 7.3 | Angular | 2.65 | 0.3 | 1 | 1.1 | 7.7 | 0.92 | 0.00 | 0.0 | 3.3 | 4.0 | 0.0 | 0.0 | 8776.0 | 0.0 | 0.0 | 8776.0 |
| 1283 | 1358 | 1.1 | 7.1 | 7.4 | 1358 | 1.3 | 3.7 | 4.8 | 8781.1 | 8777 | 8777 | 4.6 | 1.8% | 23 | 7.1 | Angular | 2.65 | 0.3 | 1 | 1.1 | 7.4 | 0.92 | 0.00 | 0.0 | 3.0 | 3.6 | 0.0 | 0.0 | 8776.5 | 0.0 | 0.0 | 8776.5 |
| 1319 | 1358 | 1.0 | 7.0 | 7.1 | 1958 | 1.2 | 3.8 | 4.3 | 8781.7 | 8777 | 8777 | 4.7 | 1.7% | 23 | 7.0 | Angular | 2.65 | 0.3 | 1 | 1.1 | 7.1 | 0.92 | 0.00 | 0.0 | 2.7 | 3.2 | 0.0 | 0.0 | 8777.0 | 0.0 | 0.0 | 8777.0 |
| 1356 | 1358 | 1.0 | 6.8 | 6.8 | 1358 | 1.0 | 3.7 | 3.8 | 8782.4 | 8778 | 8778 | 4.6 | 1.7% | 23 | 6.8 | Angular | 2.65 | 0.3 | 1 | 1.1 | 6.8 | 0.93 | 0.00 | 0.0 | 2.4 | 2.9 | 0.0 | 0.0 | 8777.8 | 0.0 | 0.0 | 8777.8 |
| 1392 | 1618 | 1.0 | 6.5 | 7.4 | 1618 | 1.0 | 3.6 | 3.9 | 8783.1 | 8779 | 8779 | 4.6 | 1.9% | 23 | 6.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.93 | 0.00 | 0.0 | 2.8 | 3.3 | 0.0 | 0.0 | 8778.6 | 0.0 | 0.0 | 8778.6 |
| 1429 | 1618 | 1.0 | 6.2 | 7.4 | 1618 | 1.0 | 3.5 | 3.9 | 8783.9 | 8779 | 8779 | 4.5 | 2.0% | 23 | 6.2 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.93 | 0.00 | 0.0 | 2.8 | 3.3 | 0.0 | 0.0 | 8779.4 | 0.0 | 0.0 | 8779.4 |
| 1465 | 1618 | 1.0 | 6.0 | 7.4 | 1618 | 1.1 | 3.4 | 4.2 | 8784.6 | 8780 | 8780 | 4.4 | 2.1% | 22 | 6.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.93 | 7.58 | 0.0 | 7.6 | 9.1 | 0.0 | 0.0 | 8780.2 | 0.0 | 0.0 | 8780.2 |
| 1502 | 1618 | 1.0 | 5.7 | 7.4 | 1618 | 1.1 | 3.3 | 4.4 | 8785.3 | 8781 | 8781 | 4.3 | 2.2% | 22 | 5.7 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.94 | 7.47 | 0.0 | 7.5 | 9.0 | 0.0 | 0.0 | 8781.0 | 0.0 | 0.0 | 8781.0 |
| 1538 | 1618 | 1.0 | 6.0 | 7.4 | 1618 | 1.2 | 3.4 | 4.6 | 8786.0 | 8781 | 8781 | 4.5 | 2.1% | 22 | 6.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.94 | 7.74 | 0.0 | 7.7 | 9.3 | 0.0 | 0.0 | 8781.5 | 0.0 | 0.0 | 8781.5 |
| 1575 | 1618 | 1.0 | 6.6 | 7.4 | 1618 | 1.2 | 3.6 | 4.8 | 8786.6 | 8782 | 8782 | 4.7 | 1.9% | 22 | 6.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.94 | 0.00 | 0.0 | 2.7 | 3.3 | 0.0 | 0.0 | 8781.9 | 0.0 | 0.0 | 8781.9 |
| 1611 | 1618 | 1.0 | 7.2 | 7.4 | 1618 | 1.3 | 3.8 | 5.0 | 8787.2 | 8782 | 8782 | 4.9 | 1.7% | 22 | 7.2 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.4 | 0.94 | 0.00 | 0.0 | 2.7 | 3.2 | 0.0 | 0.0 | 8782.3 | 0.0 | 0.0 | 8782.3 |
| 1648 | 2092 | 1.0 | 7.8 | 13.4 | 1783 | 1.3 | 4.1 | 10.9 | 8787.9 | 8783 | 8783 | 5.1 | 1.6% | 22 | 7.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.4 | 0.94 | 0.00 | 0.0 | 11.8 | 14.1 | 0.7 | 0.7 | 8782.1 | 2.1 | 6.3 | 8776.4 |
| 1684 | 2269 | 1.0 | 8.4 | 11.6 | 1988 | 1.4 | 4.3 | 10.3 | 8788.5 | 8783 | 8783 | 5.4 | 1.4% | 21 | 8.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.6 | 0.95 | 0.00 | 0.0 | 8.0 | 9.6 | 0.0 | 0.0 | 8783.2 | 1.1 | 5.0 | 8778.2 |
| 1721 | 2269 | 1.0 | 9.0 | 11.6 | 2194 | 1.4 | 4.5 | 10.4 | 8789.2 | 8784 | 8784 | 5.6 | 1.2% | 21 | 9.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.6 | 0.95 | 0.00 | 0.0 | 7.9 | 9.5 | 0.0 | 0.0 | 8783.6 | 1.1 | 5.2 | 8778.4 |
| 1757 | 2269 | 1.0 | 9.6 | 11.6 | 2269 | 1.4 | 4.7 | 10.6 | 8789.8 | 8784 | 8784 | 5.8 | 1.0% | 21 | 9.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.6 | 0.95 | 0.00 | 0.0 | 7.8 | 9.4 | 0.0 | 0.0 | 8784.0 | 1.1 | 5.4 | 8778.6 |
| 1794 | 2269 | 1.0 | 9.3 | 11.6 | 2269 | 1.4 | 4.6 | 10.8 | 8790.5 | 8785 | 8785 | 6.0 | 1.1% | 21 | 9.3 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.6 | 0.95 | 0.00 | 0.0 | 7.7 | 9.3 | 0.0 | 0.0 | 8784.5 | 1.1 | 5.5 | 8779.0 |
| 1830 | 2269 | 1.1 | 9.1 | 12.7 | 2269 | 1.5 | 4.6 | 11.0 | 8791.2 | 8785 | 8785 | 6.1 | 1.2% | 21 | 9.1 | Angular | 2.65 | 0.3 | 1 | 1.0 | 12.7 | 0.96 | 0.00 | 10.5 | 10.5 | 12.6 | 0.2 | 0.2 | 8784.9 | 1.8 | 6.8 | 8778.3 |
| 1867 | 2269 | 1.2 | 8.8 | 13.6 | 2269 | 1.5 | 4.6 | 11.0 | 8791.9 | 8786 | 8786 | 6.3 | 1.3% | 20 | 8.8 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.6 | 0.96 | 0.00 | 9.9 | 12.2 | 14.6 | 0.7 | 0.7 | 8785.0 | 2.4 | 7.9 | 8777.7 |
| 1903 | 2269 | 1.2 | 8.7 | 13.4 | 2269 | 1.4 | 4.7 | 10.7 | 8792.6 | 8786 | 8786 | 6.4 | 1.4% | 20 | 8.7 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.4 | 0.96 | 0.00 | 9.7 | 11.7 | 14.0 | 0.6 | 0.6 | 8785.6 | 2.2 | 7.8 | 8778.4 |
| 1940 | 2269 | 1.1 | 10.0 | 13.2 | 2269 | 1.4 | 5.5 | 10.4 | 8793.1 | 8787 | 8787 | 6.0 | 1.7% | 20 | 10.0 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.2 | 0.96 | 0.00 | 12.7 | 12.7 | 15.3 | 0.5 | 0.5 | 8786.6 | 2.1 | 7.2 | 8780.0 |
| 1976 | 2269 | 1.1 | 11.3 | 13.0 | 2269 | 1.3 | 6.4 | 10.1 | 8793.7 | 8788 | 8788 | 5.6 | 2.0% | 20 | 11.3 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.0 | 0.96 | 13.32 | 16.2 | 16.2 | 19.4 | 0.5 | 0.5 | 8787.6 | 1.9 | 6.5 | 8781.6 |
| 2013 | 2269 | 1.1 | 12.5 | 12.9 | 2269 | 1.3 | 7.2 | 9.7 | 8794.2 | 8789 | 8789 | 5.2 | 2.4% | 20 | 12.5 | Angular | 2.65 | 0.3 | 1 | 1.1 | 12.9 | 0.96 | 14.78 | 20.0 | 20.0 | 24.0 | 0.4 | 0.4 | 8788.6 | 1.8 | 5.9 | 8783.2 |
| 2049 | 2269 | 1.1 | 13.6 | 13.6 | 2269 | 1.2 | 8.0 | 9.4 | 8794.8 | 8790 | 8790 | 4.8 | 2.6% | 20 | 13.6 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.6 | 0.96 | 15.87 | 23.7 | 23.7 | 28.4 | 0.8 | 0.8 | 8789.2 | 2.1 | 6.2 | 8783.8 |
| 2086 | 2269 | 1.1 | 13.4 | 13.4 | 2269 | 1.2 | 8.1 | 9.1 | 8795.6 | 8790 | 8790 | 5.2 | 2.3% | 20 | 13.4 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.4 | 0.96 | 15.45 | 23.0 | 23.0 | 27.5 | 0.7 | 0.7 | 8789.8 | 2.1 | 6.4 | 8784.1 |
| 2122 | 2269 | 1.1 | 13.2 | 13.2 | 2269 | 1.2 | 8.3 | 8.8 | 8796.4 | 8791 | 8791 | 5.5 | 2.1% | 21 | 13.2 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.2 | 0.95 | 14.88 | 22.3 | 22.3 | 26.7 | 0.6 | 0.6 | 8790.4 | 2.0 | 6.6 | 8784.3 |
| 2159 | 2269 | 1.0 | 13.0 | 13.0 | 2269 | 1.1 | 8.4 | 8.5 | 8797.3 | 8791 | 8791 | 5.8 | 1.8% | 22 | 13.0 | Angular | 2.65 | 0.3 | 1 | 1.1 | 13.0 | 0.94 | 0.00 | 0.0 | 11.5 | 13.7 | 0.4 | 0.4 | 8791.0 | 1.9 | 6.8 | 8784.7 |
| 2195 | 2269 | 1.0 | 12.8 | 12.8 | 2269 | 1.1 | 8.6 | 8.6 | 8798.1 | 8792 | 8792 | 6.1 | 1.5% | 23 | 12.8 | Angular | 2.65 | 0.3 | 1 | 1.1 | 12.8 | 0.92 | 0.00 | 0.0 | 11.1 | 13.3 | 0.3 | 0.3 | 8791.7 | 1.9 | 7.0 | 8785.0 |
| 2232 | 2269 | 1.0 | 12.3 | 12.3 | 2269 | 1.0 | 8.3 | 8.3 | 8798.8 | 8792 | 8792 | 6.3 | 1.4% | 25 | 12.3 | Angular | 2.65 | 0.3 | 1 | 1.1 | 12.3 | 0.90 | 0.00 | 0.0 | 10.3 | 12.4 | 0.0 | 0.0 | 8792.4 | 1.6 | 6.7 | 8785.8 |
| 2268 | 2269 | 1.0 | 11.6 | 11.6 | 2269 | 1.0 | 7.6 | 7.6 | 8799.4 | 8793 | 8793 | 6.4 | 1.4% | 26 | 11.6 | Angular | 2.65 | 0.3 | 1 | 1.1 | 11.6 | 0.88 | 0.00 | 0.0 | 9.1 | 10.9 | 0.0 | 0.0 | 8793.0 | 1.1 | 5.9 | 8787.0 |
| 2305 | 2503 | 1.0 | 10.8 | 10.8 | 2503 | 1.0 | 6.9 | 6.9 | 8799.9 | 8793 | 8793 | 6.4 | 1.4% | 28 | 10.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.8 | 0.85 | 0.00 | 0.0 | 7.4 | 8.9 | 0.0 | 0.0 | 8793.5 | 0.6 | 0.6 | 8792.9 |
| 2341 | 2503 | 1.0 | 10.1 | 10.1 | 2503 | 1.0 | 6.2 | 6.2 | 8800.5 | 8794 | 8794 | 6.5 | 1.4% | 29 | 10.1 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.1 | 0.83 | 0.00 | 0.0 | 6.4 | 7.7 | 0.0 | 0.0 | 8794.0 | 0.1 | 0.1 | 8793.9 |
| 2378 | 2503 | 1.0 | 9.3 | 9.3 | 2503 | 1.0 | 5.5 | 5.5 | 8801.0 | 8794 | 8794 | 6.6 | 1.4% | 30 | 9.3 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.3 | 0.81 | 0.00 | 0.0 | 5.5 | 6.6 | 0.0 | 0.0 | 8794.5 | 0.0 | 0.0 | 8794.5 |
| 2414 | 2503 | 1.0 | 8.6 | 8.6 | 2503 | 1.0 | 4.8 | 4.8 | 8801.6 | 8795 | 8795 | 6.6 | 1.4% | 30 | 8.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.6 | 0.81 | 0.00 | 0.0 | 4.4 | 5.3 | 0.0 | 0.0 | 8795.0 | 0.0 | 0.0 | 8795.0 |
| 2451 | 2503 | 1.0 | 7.8 | 8.1 | 2503 | 1.0 | 4.1 | 4.4 | 8802.2 | 8796 | 8796 | 6.7 | 1.4% | 30 | 7.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.1 | 0.81 | 0.00 | 0.0 | 3.8 | 4.6 | 0.0 | 0.0 | 8795.5 | 0.0 | 0.0 | 8795.5 |
| 2487 | 2503 | 1.0 | 7.9 | 8.1 | 2503 | 1.0 | 4.2 | 4.4 | 8802.6 | 8796 | 8796 | 6.5 | 1.4% | 30 | 7.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.1 | 0.81 | 0.00 | 0.0 | 3.8 | 4.6 | 0.0 | 0.0 | 8796.1 | 0.0 | 0.0 | 8796.1 |
| 2524 | 2811 | 1.0 | 8.4 | 9.7 | 2607 | 1.0 | 4.7 | 6.1 | 8803.0 | 8797 | 8797 | 6.3 | 1.5% | 30 | 8.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.7 | 0.81 | 0.00 | 0.0 | 6.2 | 7.4 | 0.0 | 0.0 | 8796.8 | 0.0 | 0.0 | 8796.8 |
| 2560 | 3099 | 1.0 | 8.9 | 8.9 | 2791 | 1.0 | 5.3 | 5.3 | 8803.5 | 8797 | 8797 | 6.0 | 1.6% | 30 | 8.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.9 | 0.81 | 0.00 | 0.0 | 5.0 | 6.0 | 0.0 | 0.0 | 8797.5 | 0.0 | 0.0 | 8797.5 |
| 2597 | 3099 | 1.0 | 9.4 | 9.4 | 2975 | 1.0 | 5.8 | 5.8 | 8803.9 | 8798 | 8798 | 5.7 | 1.7% | 30 | 9.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.4 | 0.81 | 0.00 | 0.0 | 5.8 | 6.9 | 0.0 | 0.0 | 8798.1 | 0.0 | 0.0 | 8798.1 |
| 2633 | 3099 | 1.0 | 9.9 | 9.9 | 3099 | 1.0 | 6.4 | 6.4 | 8804.3 | 8799 | 8799 | 5.4 | 1.7% | 30 | 9.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.9 | 0.81 | 0.00 | 0.0 | 6.7 | 8.0 | 0.0 | 0.0 | 8798.8 | 0.2 | 0.2 | 8798.7 |
| 2670 | 3099 | 1.0 | 10.4 | 10.4 | 3099 | 1.0 | 6.9 | 6.9 | 8804.7 | 8799 | 8799 | 5.2 | 1.8% | 29 | 10.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.4 | 0.82 | 0.00 | 0.0 | 7.5 | 9.0 | 0.0 | 0.0 | 8799.5 | 0.5 | 0.5 | 8799.0 |
| 2706 | 3099 | 1.0 | 10.6 | 10.6 | 3099 | 1.0 | 7.1 | 7.1 | 8805.1 | 8800 | 8800 | 5.0 | 1.9% | 28 | 10.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.6 | 0.85 | 0.00 | 0.0 | 7.6 | 9.2 | 0.0 | 0.0 | 8800.2 | 0.6 | 0.6 | 8799.6 |
| 2743 | 3099 | 1.0 | 10.3 | 10.3 | 3099 | 1.0 | 6.8 | 6.8 | 8805.7 | 8801 | 8801 | 4.8 | 1.9% | 27 | 10.3 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.3 | 0.87 | 0.00 | 0.0 | 6.9 | 8.3 | 0.0 | 0.0 | 8800.9 | 0.4 | 0.4 | 8800.4 |
| 2779 | 3099 | 1.0 | 10.0 | 10.0 | 3099 | 1.0 | 6.4 | 6.4 | 8806.3 | 8802 | 8802 | 4.7 | 1.9% | 26 | 10.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.0 | 0.89 | 0.00 | 0.0 | 6.3 | 7.5 | 0.0 | 0.0 | 8801.5 | 0.3 | 0.3 | 8801.2 |
| 2816 | 3099 | 1.0 | 9.7 | 9.7 | 3099 | 1.0 | 6.1 | 6.1 | 8806.8 | 8802 | 8802 | 4.6 | 1.9% | 27 | 9.7 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.7 | 0.87 | 0.00 | 0.0 | 6.0 | 7.2 | 0.0 | 0.0 | 8802.2 | 0.2 | 0.2 | 8802.1 |
| 2852 | 3099 | 1.0 | 9.4 | 9.4 | 3099 | 1.0 | 5.8 | 5.8 | 8807.4 | 8803 | 8803 | 4.5 | 1.9% | 29 | 9.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.4 | 0.82 | 0.00 | 0.0 | 6.0 | 7.2 | 0.0 | 0.0 | 8802.9 | 0.0 | 0.0 | 8802.9 |
| 2889 | 3099 | 1.0 | 9.1 | 9.1 | 3099 | 1.0 | 5.4 | 5.4 | 8808.0 | 8804 | 8804 | 4.4 | 1.9% | 29 | 9.1 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.1 | 0.83 | 0.00 | 0.0 | 5.5 | 6.6 | 0.0 | 0.0 | 8803.6 | 0.0 | 0.0 | 8803.6 |
| 2925 | 3099 | 1.0 | 8.8 | 8.8 | 3099 | 1.0 | 5.1 | 5.1 | 8808.6 | 8804 | 8804 | 4.3 | 1.9% | 28 | 8.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.8 | 0.85 | 0.00 | 0.0 | 4.9 | 5.9 | 0.0 | 0.0 | 8804.3 | 0.0 | 0.0 | 8804.3 |
| 2962 | 3099 | 1.0 | 8.5 | 8.6 | 3099 | 1.0 | 4.8 | 4.8 | 8809.1 | 8805 | 8805 | 4.2 | 1.9% | 26 | 8.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.6 | 0.88 | 0.00 | 0.0 | 4.5 | 5.4 | 0.0 | 0.0 | 8805.0 | 0.0 | 0.0 | 8805.0 |
| 2998 | 3099 | 1.0 | 8.2 | 8.6 | 3099 | 1.1 | 4.4 | 5.2 | 8809.7 | 8806 | 8806 | 4.1 | 1.9% | 25 | 8.2 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.6 | 0.90 | 0.00 | 0.0 | 4.4 | 5.3 | 0.0 | 0.0 | 8805.6 | 0.0 | 0.0 | 8805.6 |
| 3035 | 3099 | 1.0 | 8.2 | 8.6 | 3099 | 1.2 | 4.4 | 5.7 | 8810.3 | 8806 | 8806 | 4.0 | 1.9% | 23 | 8.2 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.6 | 0.92 | 0.00 | 0.0 | 4.3 | 5.2 | 0.0 | 0.0 | 8806.3 | 0.0 | 0.0 | 8806.3 |
| 3071 | 3099 | 1.0 | 8.4 | 8.6 | 3099 | 1.3 | 4.5 | 6.1 | 8810.9 | 8807 | 8807 | 4.0 | 1.8% | 22 | 8.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.6 | 0.94 | 0.00 | 0.0 | 4.2 | 5.1 | 0.0 | 0.0 | 8807.0 | 0.0 | 0.0 | 8807.0 |
| 3108 | 3164 | 1.0 | 8.7 | 9.1 | 3133 | 1.4 | 4.7 | 7.0 | 8811.6 | 8808 | 8808 | 4.0 | 1.8% | 21 | 8.7 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.1 | 0.95 | 0.00 | 0.0 | 4.7 | 5.7 | 0.0 | 0.0 | 8807.6 | 0.0 | 0.0 | 8807.6 |
| 3144 | 3415 | 1.0 | 9.0 | 9.0 | 3285 | 1.4 | 4.9 | 6.0 | 8812.2 | 8808 | 8808 | 3.9 | 1.8% | 21 | 9.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.0 | 0.95 | 0.00 | 0.0 | 4.6 | 5.5 | 0.0 | 0.0 | 8808.3 | 0.0 | 0.0 | 8808.3 |
| 3181 | 3415 | 1.0 | 9.2 | 9.2 | 3415 | 1.4 | 5.1 | 6.1 | 8812.8 | 8809 | 8809 | 3.9 | 1.8% | 22 | 9.2 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.2 | 0.93 | 0.00 | 0.0 | 5.0 | 6.0 | 0.0 | 0.0 | 8808.9 | 0.0 | 0.0 | 8808.9 |
| 3217 | 3415 | 1.0 | 9.5 | 9.5 | 3415 | 1.5 | 5.3 | 6.2 | 8813.5 | 8810 | 8810 | 3.9 | 1.8% | 24 | 9.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.5 | 0.91 | 0.00 | 0.0 | 5.6 | 6.8 | 0.0 | 0.0 | 8809.6 | 0.2 | 0.2 | 8809.4 |
| 3254 | 3415 | 1.2 | 9.5 | 10.4 | 3415 | 1.5 | 5.2 | 6.3 | 8814.1 | 8810 | 8810 | 4.0 | 1.7% | 26 | 9.5 | Angular | 2.65 | 0.3 | 1 | 1.1 | 10.4 | 0.89 | 0.00 | 0.0 | 7.7 | 9.3 | 0.0 | 0.0 | 8810.2 | 0.6 | 0.6 | 8809.6 |
| 3290 | 3415 | 1.1 | 9.4 | 10.1 | 3415 | 1.5 | 5.0 | 6.4 | 8814.8 | 8811 | 8811 | 4.1 | 1.6% | 27 | 9.4 | Angular | 2.65 | 0.3 | 1 | 1.1 | 10.1 | 0.86 | 0.00 | 0.0 | 7.4 | 8.8 | 0.0 | 0.0 | 8810.7 | 0.4 | 0.4 | 8810.3 |
| 3327 | 3415 | 1.1 | 9.3 | 9.8 | 3415 | 1.5 | 4.8 | 6.5 | 8815.5 | 8811 | 8811 | 4.2 | 1.6% | 29 | 9.3 | Angular | 2.65 | 0.3 | 1 | 1.1 | 9.8 | 0.83 | 0.00 | 0.0 | 7.0 | 8.4 | 0.0 | 0.0 | 8811.3 | 0.3 | 0.3 | 8811.0 |
| 3363 | 3415 | 1.1 | 9.2 | 9.5 | 3415 | 1.6 | 4.6 | 6.6 | 8816.2 | 8812 | 8812 | 4.3 | 1.5% | 34 | 9.2 | Angular | 2.65 | 0.3 | 1 | 1.1 | 9.5 | 0.71 | 0.00 | 0.0 | 7.8 | 9.4 | 0.0 | 0.0 | 8811.9 | 0.1 | 0.1 | 8811.8 |
| 3400 | 3415 | 1.0 | 9.1 | 9.1 | 3415 | 1.6 | 4.3 | 6.7 | 8816.9 | 8812 | 8812 | 4.4 | 1.5% | 35 | 9.1 | Angular | 2.65 | 0.3 | 1 | 1.1 | 9.1 | 0.68 | 0.00 | 0.0 | 7.5 | 9.0 | 0.0 | 0.0 | 8812.4 | 0.0 | 0.0 | 8812.4 |
| 3436 | 3516 | 1.0 | 8.9 | 9.9 | 3504 | 1.6 | 4.1 | 6.9 | 8817.6 | 8813 | 8813 | 4.6 | 1.4% | 35 | 8.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.9 | 0.68 | 0.00 | 0.0 | 8.8 | 10.6 | 0.0 | 0.0 | 8813.0 | 0.3 | 0.3 | 8812.7 |

| | | |
|---|---|---|
| Safety Factor | 1 | 1.1 = standard; consider larger values if ice or debris impact or uncertainty in design variables |
| Begin Station | 1100 | ft |
| End Station | 4750 | ft |
| Channel Length | 3650 | ft |
| Channel Type | 1 | 1=Natural, 0=Trapezoidal or any number inbetween |
| g | 32.2 | ft/s^2 |

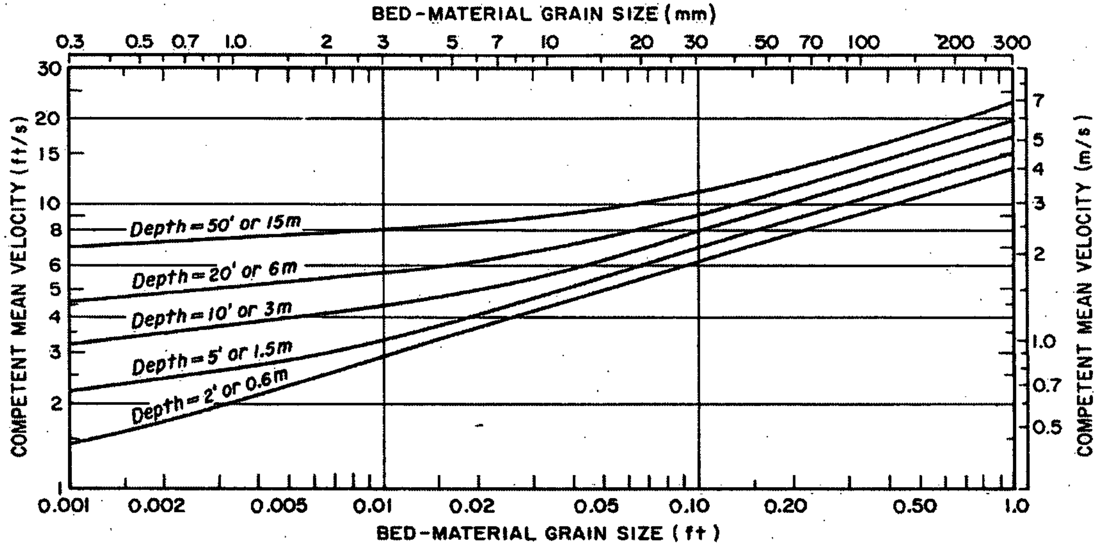
| | | | | |
|---|---|---|---|---|
| Pavement depth | | 2 | | 1 |
| Cohesive limit vel | | 6 | | 6 |
| Bed size (in) | 6 | | 3 | |

| | Local Channel | | | | Total Channel | | | | | | | | | | | Riprap Properties | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Station at Upstream end of bend | Vratio(Vss/Vavg) | Vavg Average Velocity (ft/s) | Vss (ft/s) | Station at Upstream end of bend | Vratio(Vss/Vavg) | Vavg Average Velocity (ft/s) | Vss (ft/s) | Water Surface Elevation (ft) | Min Channel Elevation (ft) | Riprap Analysis Elevation (ft) | Local Depth of Flow (ft) | Channel Slope (%) | Bank Angle (degrees) | Channel Velocity (ft/s) | Riprap Angularity | Specific Gravity | Stability Coefficient (Cs) | Ct | Velocity Distribution Coeff (Cv) | Vdesign (ft/s) | Side Slope Correction Factor (K1) | Steep Slop D30 | Ishbash D30 | d30 (in) | d50(in) | Scour | MaxScour | Scour El | Scour | MaxScour | Scour El |
| 3473 | 3608 | 1.1 | 9.1 | 11.4 | 3608 | 1.6 | 4.1 | 7.6 | 8818.3 | 8814 | 8814 | 4.7 | 1.4% | 35 | 9.1 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.4 | 0.68 | 0.00 | 0.0 | 12.3 | 14.8 | 0.0 | 0.0 | 8813.6 | 1.0 | 4.3 | 8809.3 |
| 3509 | 3608 | 1.2 | 9.5 | 12.5 | 3608 | 1.6 | 4.3 | 7.6 | 8819.1 | 8814 | 8814 | 4.9 | 1.5% | 34 | 9.5 | Angular | 2.65 | 0.3 | 1 | 1.1 | 12.5 | 0.71 | 0.00 | 0.0 | 15.4 | 18.5 | 0.3 | 0.3 | 8813.9 | 1.6 | 5.3 | 8808.9 |
| 3546 | 3608 | 1.1 | 9.8 | 11.7 | 3608 | 1.4 | 4.5 | 6.5 | 8819.9 | 8815 | 8815 | 5.1 | 1.5% | 30 | 9.8 | Angular | 2.65 | 0.3 | 1 | 1.1 | 11.7 | 0.80 | 0.00 | 0.0 | 11.3 | 13.5 | 0.0 | 0.0 | 8814.8 | 1.2 | 4.9 | 8809.9 |
| 3582 | 3608 | 1.1 | 10.2 | 11.0 | 3608 | 1.2 | 4.6 | 5.5 | 8820.7 | 8815 | 8815 | 5.3 | 1.6% | 27 | 10.2 | Angular | 2.65 | 0.3 | 1 | 1.1 | 11.0 | 0.87 | 0.00 | 0.0 | 8.5 | 10.2 | 0.0 | 0.0 | 8815.4 | 0.8 | 0.8 | 8814.6 |
| 3619 | 3666 | 1.0 | 10.5 | 10.5 | 3666 | 1.0 | 4.8 | 4.8 | 8821.4 | 8816 | 8816 | 5.5 | 1.6% | 31 | 10.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.5 | 0.78 | 0.00 | 0.0 | 8.1 | 9.7 | 0.0 | 0.0 | 8816.0 | 0.5 | 0.5 | 8815.5 |
| 3655 | 3666 | 1.0 | 10.0 | 10.0 | 3666 | 1.0 | 4.4 | 4.4 | 8822.1 | 8817 | 8817 | 5.5 | 1.7% | 42 | 10.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 10.0 | 0.43 | 0.00 | 0.0 | 15.1 | 18.1 | 0.0 | 0.0 | 8816.6 | 0.2 | 0.2 | 8816.4 |
| 3692 | 3975 | 1.0 | 9.5 | 9.5 | 3783 | 1.0 | 4.0 | 4.0 | 8822.8 | 8817 | 8817 | 5.5 | 1.7% | 40 | 9.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 9.5 | 0.49 | 0.00 | 0.0 | 11.0 | 13.1 | 0.0 | 0.0 | 8817.3 | 0.0 | 0.0 | 8817.3 |
| 3728 | 3975 | 1.0 | 8.9 | 8.9 | 3949 | 1.0 | 3.6 | 3.6 | 8823.4 | 8818 | 8818 | 5.4 | 1.8% | 39 | 8.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.9 | 0.55 | 0.00 | 0.0 | 8.2 | 9.9 | 0.0 | 0.0 | 8818.0 | 0.0 | 0.0 | 8818.0 |
| 3765 | 3975 | 1.0 | 8.3 | 8.3 | 4043 | 1.0 | 3.1 | 3.1 | 8824.1 | 8819 | 8819 | 5.4 | 1.8% | 38 | 8.3 | Angular | 2.65 | 0.3 | 1 | 1.0 | 8.3 | 0.60 | 0.00 | 0.0 | 6.3 | 7.5 | 0.0 | 0.0 | 8818.7 | 0.0 | 0.0 | 8818.7 |
| 3801 | 3975 | 1.0 | 7.8 | 7.8 | 4043 | 1.0 | 2.7 | 2.7 | 8824.8 | 8819 | 8819 | 5.4 | 1.8% | 36 | 7.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.8 | 0.64 | 0.00 | 0.0 | 4.8 | 5.8 | 0.0 | 0.0 | 8819.3 | 0.0 | 0.0 | 8819.3 |
| 3838 | 3975 | 1.1 | 7.3 | 7.3 | 4043 | 1.0 | 2.5 | 2.7 | 8825.3 | 8820 | 8820 | 5.2 | 1.9% | 35 | 7.3 | Angular | 2.65 | 0.3 | 1 | 1.0 | 7.3 | 0.68 | 0.00 | 0.0 | 3.8 | 4.5 | 0.0 | 0.0 | 8820.1 | 0.0 | 0.0 | 8820.1 |
| 3874 | 3975 | 1.1 | 6.8 | 6.8 | 4043 | 1.1 | 2.5 | 2.9 | 8825.7 | 8821 | 8821 | 4.7 | 2.1% | 34 | 6.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 6.8 | 0.72 | 8.73 | 0.0 | 8.7 | 10.5 | 0.0 | 0.0 | 8821.0 | 0.0 | 0.0 | 8821.0 |
| 3911 | 3975 | 1.1 | 6.4 | 6.4 | 4043 | 1.2 | 2.6 | 3.1 | 8826.2 | 8822 | 8822 | 4.2 | 2.3% | 32 | 6.4 | Angular | 2.65 | 0.3 | 1 | 1.0 | 6.4 | 0.76 | 8.08 | 0.0 | 8.1 | 9.7 | 0.0 | 0.0 | 8822.0 | 0.0 | 0.0 | 8822.0 |
| 3947 | 3975 | 1.1 | 6.0 | 6.2 | 4043 | 1.2 | 2.6 | 3.3 | 8826.6 | 8823 | 8823 | 3.7 | 2.4% | 31 | 6.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 6.2 | 0.79 | 7.37 | 0.0 | 7.4 | 8.8 | 0.0 | 0.0 | 8822.9 | 0.0 | 0.0 | 8822.9 |
| 3984 | 4660 | 1.1 | 5.7 | 14.5 | 4043 | 1.3 | 2.7 | 6.3 | 8827.0 | 8824 | 8824 | 3.3 | 2.5% | 29 | 5.7 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.5 | 0.82 | 6.73 | 0.0 | 20.3 | 24.3 | 1.0 | 1.0 | 8822.7 | 2.1 | 4.7 | 8819.1 |
| 4020 | 4660 | 1.1 | 5.9 | 14.5 | 4043 | 1.4 | 2.9 | 6.7 | 8827.5 | 8824 | 8824 | 3.2 | 2.4% | 28 | 5.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.5 | 0.85 | 6.55 | 0.0 | 19.3 | 23.2 | 1.0 | 1.0 | 8823.4 | 2.0 | 4.5 | 8819.8 |
| 4057 | 4660 | 1.1 | 6.1 | 14.4 | 4093 | 1.4 | 3.0 | 6.9 | 8828.0 | 8825 | 8825 | 3.1 | 2.3% | 27 | 6.1 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.4 | 0.87 | 6.36 | 0.0 | 18.5 | 22.1 | 0.9 | 0.9 | 8824.0 | 1.9 | 4.3 | 8820.6 |
| 4093 | 4660 | 1.1 | 6.3 | 14.3 | 4232 | 1.5 | 3.2 | 7.0 | 8828.5 | 8826 | 8826 | 3.0 | 2.1% | 25 | 6.3 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.3 | 0.89 | 6.16 | 0.0 | 17.7 | 21.3 | 0.9 | 0.9 | 8824.6 | 1.9 | 4.1 | 8821.4 |
| 4130 | 4660 | 1.1 | 6.5 | 14.2 | 4371 | 1.5 | 3.3 | 7.2 | 8829.0 | 8826 | 8826 | 2.9 | 2.0% | 25 | 6.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.2 | 0.90 | 0.00 | 0.0 | 17.5 | 21.0 | 0.8 | 0.8 | 8825.3 | 1.8 | 4.0 | 8822.1 |
| 4166 | 4660 | 1.1 | 6.7 | 14.1 | 4510 | 1.5 | 3.5 | 7.3 | 8829.5 | 8827 | 8827 | 2.8 | 1.8% | 25 | 6.7 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.1 | 0.90 | 0.00 | 0.0 | 17.3 | 20.8 | 0.8 | 0.8 | 8825.9 | 1.7 | 3.8 | 8822.9 |
| 4203 | 4660 | 1.1 | 6.9 | 14.0 | 4642 | 1.5 | 3.7 | 7.4 | 8830.0 | 8827 | 8827 | 2.7 | 1.7% | 25 | 6.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 14.0 | 0.90 | 0.00 | 0.0 | 17.2 | 20.7 | 0.8 | 0.8 | 8826.5 | 1.7 | 3.6 | 8823.7 |
| 4239 | 4660 | 1.1 | 7.0 | 13.9 | 4642 | 1.5 | 3.8 | 7.5 | 8830.7 | 8828 | 8828 | 2.7 | 1.7% | 25 | 7.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.9 | 0.90 | 0.00 | 0.0 | 17.0 | 20.4 | 0.7 | 0.7 | 8827.3 | 1.6 | 3.5 | 8824.5 |
| 4276 | 4660 | 1.1 | 6.9 | 13.8 | 4642 | 1.6 | 4.0 | 7.6 | 8831.4 | 8829 | 8829 | 2.6 | 1.9% | 25 | 6.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.8 | 0.90 | 0.00 | 0.0 | 16.8 | 20.2 | 0.7 | 0.7 | 8828.1 | 1.6 | 3.5 | 8825.3 |
| 4312 | 4660 | 1.1 | 6.9 | 13.7 | 4642 | 1.6 | 4.2 | 7.7 | 8832.2 | 8830 | 8830 | 2.6 | 2.0% | 25 | 6.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.7 | 0.90 | 0.00 | 0.0 | 16.6 | 19.9 | 0.7 | 0.7 | 8828.9 | 1.5 | 3.4 | 8826.2 |
| 4349 | 4660 | 1.1 | 7.0 | 13.7 | 4642 | 1.6 | 4.0 | 7.8 | 8833.1 | 8830 | 8830 | 2.7 | 2.1% | 25 | 7.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.7 | 0.90 | 6.11 | 0.0 | 16.1 | 19.4 | 0.7 | 0.7 | 8829.7 | 1.5 | 3.5 | 8826.8 |
| 4385 | 4660 | 1.1 | 7.1 | 13.6 | 4642 | 1.6 | 3.6 | 7.5 | 8834.1 | 8831 | 8831 | 3.0 | 2.1% | 25 | 7.1 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.6 | 0.90 | 6.62 | 6.4 | 15.6 | 18.7 | 0.7 | 0.7 | 8830.5 | 1.6 | 3.7 | 8827.4 |
| 4422 | 4660 | 1.0 | 7.2 | 13.5 | 4642 | 1.5 | 3.3 | 7.1 | 8835.2 | 8832 | 8832 | 3.2 | 2.2% | 25 | 7.2 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.5 | 0.90 | 7.15 | 6.6 | 15.1 | 18.1 | 0.7 | 0.7 | 8831.3 | 1.6 | 4.0 | 8828.0 |
| 4458 | 4660 | 1.0 | 8.5 | 13.4 | 4642 | 1.4 | 3.7 | 6.8 | 8835.8 | 8832 | 8832 | 3.4 | 2.0% | 25 | 8.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.4 | 0.90 | 0.00 | 9.3 | 14.6 | 17.5 | 0.7 | 0.7 | 8831.8 | 1.7 | 4.2 | 8828.3 |
| 4495 | 4660 | 1.0 | 10.0 | 13.3 | 4642 | 1.3 | 4.2 | 6.4 | 8836.4 | 8833 | 8833 | 3.6 | 1.7% | 25 | 10.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.3 | 0.90 | 0.00 | 12.8 | 14.1 | 16.9 | 0.6 | 0.6 | 8832.2 | 1.7 | 4.4 | 8828.5 |
| 4531 | 4660 | 1.0 | 11.6 | 13.2 | 4642 | 1.2 | 4.7 | 6.0 | 8837.1 | 8833 | 8833 | 3.8 | 1.4% | 25 | 11.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.2 | 0.90 | 0.00 | 17.0 | 17.0 | 20.4 | 0.6 | 0.6 | 8832.7 | 1.7 | 4.6 | 8828.7 |
| 4568 | 4660 | 1.0 | 12.5 | 13.1 | 4642 | 1.2 | 5.0 | 5.6 | 8837.9 | 8834 | 8834 | 4.1 | 1.3% | 25 | 12.5 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.1 | 0.90 | 0.00 | 19.8 | 19.8 | 23.8 | 0.6 | 0.6 | 8833.2 | 1.7 | 4.9 | 8828.9 |
| 4604 | 4660 | 1.0 | 12.6 | 13.0 | 4642 | 1.1 | 4.9 | 5.2 | 8839.1 | 8834 | 8834 | 4.6 | 1.6% | 25 | 12.6 | Angular | 2.65 | 0.3 | 1 | 1.0 | 13.0 | 0.90 | 0.00 | 20.3 | 20.3 | 24.4 | 0.5 | 0.5 | 8833.9 | 1.8 | 5.4 | 8829.0 |
| 4641 | 4660 | 1.0 | 12.8 | 12.9 | 4642 | 1.0 | 4.8 | 4.8 | 8840.3 | 8835 | 8835 | 5.1 | 1.8% | 25 | 12.8 | Angular | 2.65 | 0.3 | 1 | 1.0 | 12.9 | 0.90 | 0.00 | 20.9 | 20.9 | 25.0 | 0.5 | 0.5 | 8834.7 | 1.8 | 5.9 | 8829.2 |
| 4677 | 4792 | 1.0 | 12.0 | 12.0 | 4746 | 1.0 | 4.5 | 4.5 | 8841.3 | 8836 | 8836 | 5.5 | 2.0% | 25 | 12.0 | Angular | 2.65 | 0.3 | 1 | 1.0 | 12.0 | 0.90 | 13.69 | 18.3 | 18.3 | 21.9 | 0.0 | 0.0 | 8835.8 | 1.3 | 5.5 | 8830.4 |
| 4714 | 4970 | 1.0 | 9.9 | 11.7 | 4855 | 1.0 | 3.6 | 4.8 | 8842.3 | 8837 | 8837 | 5.7 | 2.1% | 25 | 9.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.7 | 0.90 | 12.55 | 0.0 | 12.6 | 15.1 | 0.0 | 0.0 | 8836.6 | 1.2 | 5.4 | 8831.1 |
| 4750 | 4970 | 1.0 | 7.9 | 11.7 | 4964 | 1.0 | 2.8 | 4.8 | 8843.2 | 8837 | 8837 | 5.9 | 2.1% | 25 | 7.9 | Angular | 2.65 | 0.3 | 1 | 1.0 | 11.7 | 0.90 | 11.17 | 0.0 | 11.2 | 13.4 | 0.0 | 0.0 | 8837.3 | 1.2 | 5.6 | 8831.7 |

Neill Competent velocity

Interpolation table

| bed | Log Bed Size (ft) | depth (ft) | Comp Mean Vel (ft/s) |
|---|---|---|---|
| 0.001 | -3 | 2 | 1.5 |
| 0.001 | -3 | 5 | 2.2 |
| 0.001 | -3 | 10 | 3.2 |
| 0.001 | -3 | 20 | 4.6 |
| 0.001 | -3 | 50 | 7 |
| 0.01 | -2 | 2 | 2.7 |
| 0.01 | -2 | 5 | 3 |
| 0.01 | -2 | 10 | 4.5 |
| 0.01 | -2 | 20 | 5.8 |
| 0.01 | -2 | 50 | 8 |
| 0.1 | -1 | 2 | 6.1 |
| 0.1 | -1 | 10 | 8 |
| 0.1 | -1 | 20 | 9 |
| 0.1 | -1 | 50 | 11 |
| 1 | 0 | 2 | 13.12 |
| 1 | 0 | 10 | 16.564 |
| 1 | 0 | 50 | 22.96 |
| Test Interpolation | | | |
| 1 | 0 | 20 | 19.85425 |



# PART C

# Geotechnical Investigations, Analyses and Evaluations

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## Appendices

Appendix C1 – Slope Stability Analysis Output
Appendix C2 – Seepage Analysis Output

# 1.0 Purpose and Scope

During Fall 2011, a subsurface exploration program was undertaken to fill data gaps relative to design features of an open ponds lime addition treatment system at the St. Louis Ponds portion of the Rico-Argentine Site that is a treatment alternative under Task F of the Remedial Action Work Plan (Work Plan) accompanying the Unilateral Administrative Order (UAO) for this Site. Key elements of this alternative treatment system include a treatment solids handling system, including modifications to the St. Louis Tunnel adit collapse area addressed in Task D of the Work Plan, modifications to the existing ponds and their embankments per Tasks B and F of the Work Plan, and construction of a new solids drying facility and permanent repository required by Task C of the Work Plan. This Part C deals specifically with the preliminary global geotechnical stability analyses of the existing flood dike and pond embankments. For the purposes of this study the flood dike is the north-south oriented riprap armoured embankment separating the St. Louis Ponds on the east from the Dolores River to the west. The pond embankments are the east-west oriented dikes that contain the series of adjacent individual ponds that comprise the St. Louis Ponds system.

# 2.0 Ground Survey

A new aerial topographic survey of the St. Louis Ponds, plus adjoining lands was completed in August 2011. Certain features such as the new interim drying cells constructed in the former Ponds 16/17 area during Fall 2011, and several cross-sections of the flood dike and Dolores River channel, were surveyed by conventional techniques during Summer and Fall 2011. The slope stability analyses of the flood dike and pond embankments presented in this Part C are based on this newest survey information.

# 3.0 Exploratory Drilling and Test Pits

## 3.1 Soil Borings

As part of the broader design effort noted above, soil borings ED-1 through ED-6, and monitoring wells MW-1 through MW-6 were completed in September/October 2011, to gather information relative the flood dike and pond embankments. Both types of holes were drilled by Boart Longyear Company, using a Sonic C600 drill rig. The holes were logged for soil type and stratification by a professional geotechnical engineer or geologist. Split-spoon samples were collected at selected depths in the largely granular soil profile. At completion, the boreholes were backfilled with bentonite chips, or in the case of the monitoring wells, completed with machine-slotted well screen (2-inch nominal diameter), Schedule 40 PVC riser, sand pack and surface seal. Boring logs, including the field observations and certain of the laboratory index test results are included in Appendix A1 of Part A of this report.

## 3.2 Test Pits

Test Pits TP2011-3, -9, -10, -15, -18, -19 and -20 were also completed in September/October 2011, to gather information on flood dike and pond embankments stratification, and to collect bulk samples for grain size, permeability and compaction testing. The test pits were completed using a Caterpillar 308CR mini-excavator or a Caterpillar 330C long-reach backhoe. The test pits were logged by a professional geotechnical engineer. The test pits logs are included in Appendix A1 of Part A of this report.

# 4.0 Laboratory Testing

## 4.1 Geotechnical Testing

Selected soil samples from the soil borings, monitoring wells and test pits were sent to Western Technologies, Inc. in Durango, Colorado, for index testing (moisture content, grain size and Atterberg Limits). Bulk samples, mostly of the near-surface soils, were tested by Western Technologies for Standard Proctor compaction parameters, relative to potential reuse as engineered fill. The results of the laboratory testing completed to date are included in Appendix A2 of Part A of this report. The moisture contents are included on the soil boring logs in Appendix A1 of Part A.

Moisture contents in the flood dike fill typically range from about 5 to 15 percent, while those in the pond embankments fill range from about 10 to 25 percent. The fines content of the flood dike and pond embankments fill range from 15 to 23 percent and 12 to 42 percent, respectively.

## 4.2 Treatment Solids Testing

Relatively undisturbed samples of drained precipitated treatment solids from the bottom of Pond 18 were collected using the thin-wall Shelby tube sampling method, augmented by a backhoe (due to access limitations for a drill rig). Three tubes were collected from the upper two (2) feet of the solids, before removal to the interim drying facility, and three tubes were collected from the remaining two (2) feet of the solids after the required solids removal was completed. These tubes were sealed, packed and shipped to AECOM's geotechnical laboratory in Vernon Hills, Illinois.

The tubes from the upper two (2) feet of the pond solids were tested for moisture content, specific gravity, unit weight, grain size, triaxial permeability, consolidation, laboratory vane shear and consolidated-undrained triaxial compression. The results of tests completed to date are included in Appendix A2 of Part A of this report. The triaxial permeability and laboratory vane shear test results were used in the global dike stability analyses presented herein.

The drained solids have a specific gravity of 3.0, and classify as high-plasticity, inorganic silt (MH) per the Unified Soil Classification System. Liquid and plastic limits range from 67 to 83 percent and 62 to 79 percent, respectively.

Undrained shear strengths from laboratory vane shear tests ranged from 730 to 1450 psf (peak) to 130 to 200 psf (residual).

Combined triaxial permeability tests followed by staged triaxial tests were completed on the deeper tube samples. The measured hydraulic conductivity was on the order of $2 \times 10^{-6}$ cm/sec.

The broader suite of the test results will be used for the final drying facility and repository designs and discussed in subsequent design submittals.

# 5.0 Summary of Preliminary Findings

## 5.1 Flood Dike Stability

As noted, the flood dike runs generally north-to-south along the west side of the St. Louis Ponds site, separating the ponds from the Dolores River. Test pits TP20011-9 and -10 indicate 14 to 16 feet of fill in the northern portion of the flood dike (north and west of Pond 18), decreasing to 10 to 13 feet in the central section of the dike on the west side of Ponds 12, 14 and 15 (per MW-2, MW-3 and ED-5). Borings ED-1 and ED-2 indicate about five (5) feet of fill in the southern portion of the flood dike, west of Ponds 6 through 8. The fill is typically granular in nature, consisting of varying percentages of sand, gravel and cobbles, and lesser amounts of silt and clay. In the vicinity of Test pits TP2011-9 and -10, the silt and fine sand fraction is composed mostly of calcines. By Standard Penetration test, the fill is typically classified as medium dense to occasionally loose.

Below the dike fill, native alluvium consisting of varying percentages of sand, gravel, silt and cobbles was identified to 20 to 25 feet below the dike crest. This layer varies from very dense to medium dense, typically decreasing in penetration resistance (and thus density) with depth. Some organics were observed in the upper 0.5 to one (1) foot of the alluvium in Borings ED-2 and ED-5, perhaps indicative of former overbank deposits. The near-surface groundwater table was observed near the contact of the dike fill and upper alluvium.

Below the upper alluvial stratum, a somewhat finer sandy alluvium was encountered in most of the borings listed above. This deeper alluvium is typically medium dense to loose as estimated from SPT penetration test results (i.e., n values).

By observation of the topographic map, six east-to-west cross sections with steeper downstream slopes were selected for global stability analysis, using the Slope/W$^{TM}$ software (Geoslope International, 2007A). The locations of these selected cross-sections are shown in plan on Figure 5.1. The sections are presented looking upstream, with the Dolores River to the left side of the section. The results of preliminary static analyses at normal water level in the ponds are presented in Table 5.1. Additional analyses for atypical loading cases such as earthquake or flood-stage in the river, and with refined soil density and strength parameters from additional laboratory testing currently underway, will be completed as part of final design analyses of the need for improvements to the flood dike.

The preliminary results indicate generally acceptable factors of safety ($\geq$ 1.5 for the static loading case) at normal water level in the ponds. Areas similar in geometry to the downstream dike toe next to the river (opposite Pond 15) require further analysis, and may ultimately require regrading or adding to the toe riprap to flatten the toe slope. Output results from the stability analyses run to date are included in Appendix C1.

Additional seepage analysis using Seep/W$^{TM}$ (Geoslope International, 2007B) at other flood dike cross sections are underway to estimate the phreatic surface position. If triaxial specimens can be compacted to stand in the cell, the values of vertical hydraulic conductivity used as input for the seepage analysis will be obtained from triaxial permeability tests. Direct shear tests will be run on samples of embankment fill and alluvium recovered from the test pits to check the effective angle of internal friction and effective cohesion used in the flood dike stability analysis. The samples (scalped to the maximum particle size as required) will be compacted to a reasonable percentage of the Standard Proctor maximum dry unit weight, at near the in-place moisture content. The stability analyses will be updated if/as appropriate based on the results of the ongoing and planned additional testing.

## 5.2 Pond Embankment Stability

In contrast to the primary flood dike that runs north-to-south along the west side of most of the active ponds, the pond embankments run mostly east-to-west, separating the cascading series of ponds that drain, in order, from Pond 18 (highest) through Ponds 15 ,14, 12, 11, 9, 8, 7, 6 and 5. Certain of these embankments also separate wet from dry ponds such as Ponds 13 and 16/17. The embankments between dry Pond 13 and Ponds 11/12/14, and Ponds 9 and 10, run more north-to-south.

Test pits TP20011-11, -15, -18 and -20 indicate 15 to 20+ feet of fill in the embankments between Ponds 13 and 16/17 and Ponds 13 and 10. Similar to the flood dike, the embankment fill generally decreases in thickness from north to south. The fill is 22 feet thick on the east side of Pond 15 (MW-5D), 10 to 14 feet thick between Ponds 14/15, 12/13 and 10/13 (per ED-4, ED-5 and MW-1D), and about 5 to 7.5 feet thick between Ponds 9/10 and 6/7 (ED-3 and ED-6). The fill is typically granular in nature, consisting of varying percentages of sand, gravel and cobbles, and lesser amounts of silt and clay. The silt and fine sand fraction is composed of calcines in the vicinity of MW-5. By Standard Penetration test, the fill is typically classified as medium dense to loose.

Below the embankment fill, native alluvium consisting of varying percentages of sand, gravel, silt and cobbles was identified to 15 to 30+ feet below the dike crest. This layer varies from very dense to medium dense, typically decreasing with depth. Some natural organic layers were observed in the upper one (1) to 2.5 feet of the alluvium in borings MW-5, ED-5, MW-1 and ED-3. The near-surface groundwater table was observed at 12 to 15 feet below the embankment crest at MW-5 and ED-5 (near Ponds 14 and 15), and near the contact of the embankment fill and upper alluvium at ED-3 and ED-6 (near Ponds 6 through 9).

Below the upper alluvial stratum, a somewhat finer, sandy alluvium was encountered in the borings south of Ponds 10/11. This deeper alluvium is typically medium dense to loose by SPT n-value.

Eight north-to-south embankment cross sections between adjoining ponds were selected for global stability analysis using the Slope/W$^{TM}$ software. The locations of these selected cross-sections are shown in plan on Figure 5.1. The sections were prepared with the lower pond to the left side of the section. Stability analyses were completed for both the upstream and downstream slope of each embankment. With some variability in embankment construction (differing crest widths and side slopes) and support conditions indicated by the exploration results, a sensitivity analysis was completed for global stability versus a range of embankment strength parameters indicated as being reasonable per the boring and test pit logs and Standard Penetration Test n-values. The results of preliminary static stability analyses of the pond embankments at normal water level in the ponds are presented in Table 5.2.

The results indicate that depending on the side slope grades, which are variable among the pond embankments, strength parameters of 32 to 34 degrees (angle of internal friction) and zero to 50 psf (cohesion) in the embankment fill are sufficient to provide a global factor of safety of 1.4 or greater. These are consistent with the character of the embankment fill. Output results are included in Appendix C1.

With the observation that most of the pond embankments have been in place for more than 30 years, global factors of safety less than 1.0 are not consistent with the embankment performance to date. However, for long-term performance as settling basins that are part of an open ponds treatment and solids management system, the embankments between some of the ponds will require regrading to flatten the slopes and widen the crest, and in some cases, to armor the slopes to protect against erosion. Additional analyses for atypical loading cases, and with updated soil density and strength parameters from ongoing laboratory testing, will be completed in 2012 as part of final design for upgrades to these pond embankments.

As for the flood dike, additional seepage analysis using Seep/W$^{TM}$ at other pond embankment cross sections are underway to estimate the phreatic surface position. If triaxial specimens can be compacted to stand in the cell, the values of vertical hydraulic conductivity used as input for the seepage analysis will be obtained from triaxial permeability tests. Direct shear tests will be run on samples of embankment fill and alluvium recovered from the test pits to check the effective angle of internal friction and effective cohesion used in the flood dike stability analysis. The samples (scalped to the maximum particle size as required) will be compacted to a reasonable percentage of the Standard Proctor maximum dry unit weight, at near the in-place moisture content. The stability analyses will be updated if/as appropriate based on the results of the ongoing and planned additional testing.

## 5.3 Seepage and Piping

As a first-order check against seepage-induced piping or internal erosion, the flood dike and pond embankments are evaluated to assess the degree to which they appear to be: 1) comprised of materials that are inherently resistant to seepage-induced erosion; and 2) are not subject to typical hydraulic seepage conditions that create high exit gradients at the downstream toe of the slopes. To evaluate these conditions, two analyses were completed. First, treating the flood dike and embankments as the equivalent of a single-stage filter, standard filter criteria require that the embankment material be a filter within itself (broadly and not gap graded), which is established by the following relationship:

$D_{85f} / D_{15f} > 5$

Review of the grain size curves for the flood dike and pond embankments fill indicates that the above ratio of $D_{85f} / D_{15f}$ is well in excess of 5.

Second, two flood dike sections and two pond embankment sections with higher headwater to tailwater differential elevations (and thus higher potential seepage gradients) were analyzed for the exit gradient at the downstream toe using the program Seep/W$^{TM}$. Since there is often an upward component to the gradient at the toe of an embankment where the overburden or confining weight is the least, the exit gradient must be less than 1.0 to avoid a quick condition and the potential for progressive internal erosion by piping. The results of the exit gradient analyses are summarized in Table 5.3 and included in Appendix C2.

For the flood dike, the two sections checked indicate a low exit gradient (0.3 or less). The results for the two pond embankments with the highest headwater to tailwater ratio are higher, and in the case of the embankment between Ponds 14 and 15, are considered higher than desirable for long-term performance. Further evaluation of these and other embankment sections will be completed based on laboratory permeability testing of compacted bulk samples of the dike fill and upper foundation alluvium, since the hydraulic conductivity values assumed in the analyses have significant influence on the results.

Additional seepage analyses using Seep/W™ at other flood dike and pond embankment cross sections will be run to estimate the range of exit gradients near the downstream toe. To refine the output from these analyses, the range of vertical hydraulic conductivity used as input for the seepage analyses will be updated as obtained from triaxial permeability tests on compacted samples of embankment fill and underlying alluvium.

# 6.0 References

Geoslope International. 2007A. Slope/W User's Manual.

Geoslope International. 2007B. Seep/W User's Manual.

# TABLES

### Table 5.1 – Factor of Safety by Location

| River Station | Location | Global Factor of Safety |
|---|---|---|
| 18+25 | West side of Pond 8 | 2.0 |
| 23+25 | West side of Pond 11 | 1.5 |
| 32+00 | West side of Pond 15 | 1.5 (1.37 @ downstream toe) |
| 35+00 | West side of Pond 18 | 1.6 |
| 37+50 | West side of Pond 18 | 2.6 |
| 44+50 | North end of Site | 1.6 |

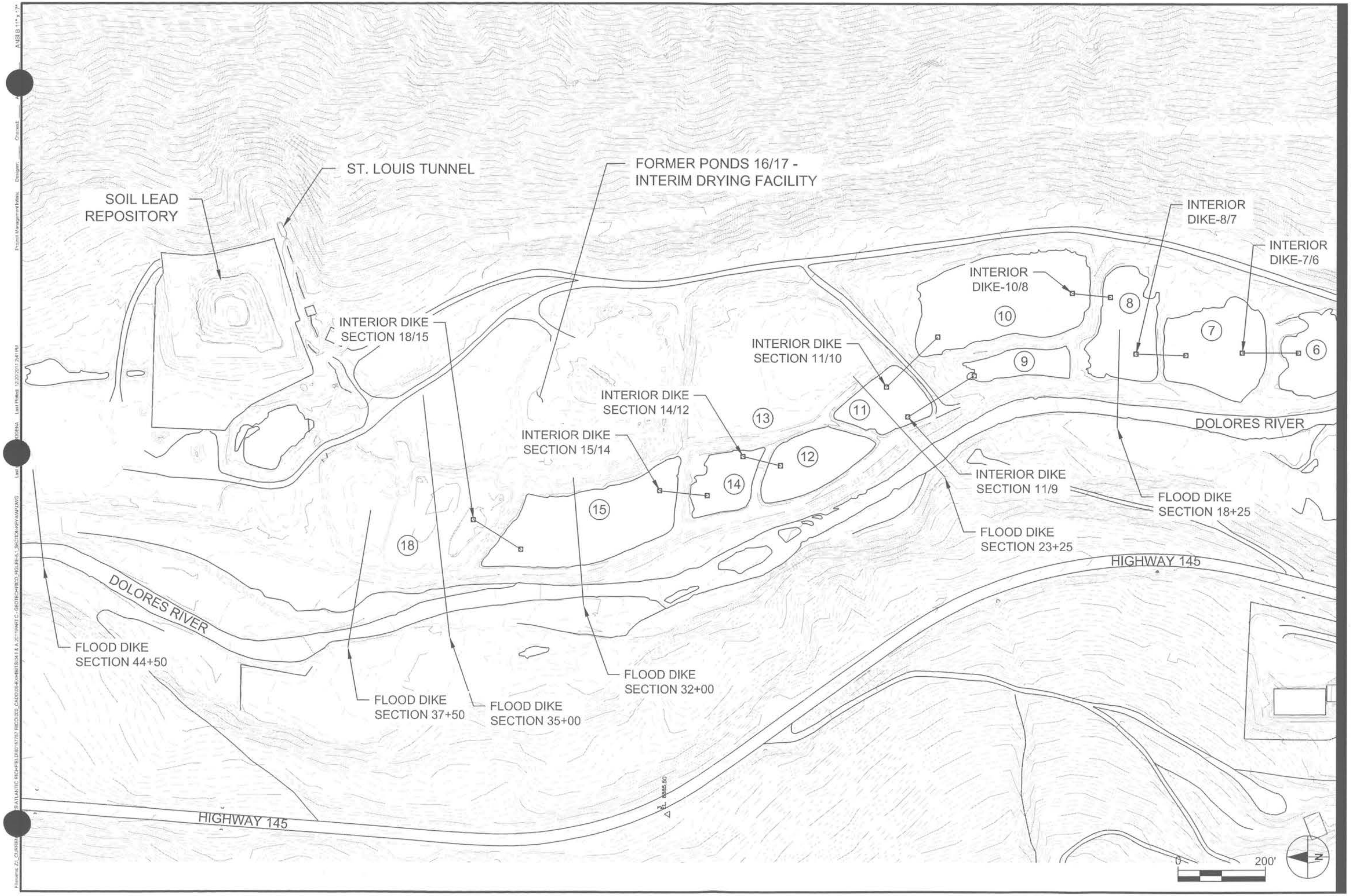
### Table 5.2 – Static Analysis Results

| Embankment Section | Global Factor of Safety (Static Case) | | |
|---|---|---|---|
| | φ' = 32°; c' = 0 | φ' = 34°; c' = 0 | φ' = 34°; c' = 50 psf |
| Pond 6/7 | 0.95 / 2.74 | 1.02 / ---- | 1.56 / ---- |
| Pond 7/8 | 1.01 / 2.47 | 1.09 / 2.09 | 1.76 / ---- |
| Pond 8/10 | 1.39 / 1.63 | ---- / ---- | ---- / ---- |
| Pond 9/11 | 1.63 / 1.17 | ---- / 1.47 | ---- / ---- |
| Pond 10/11 | 1.06 / 1.01 | 1.14 / 1.25 | 1.37 / 1.76 |
| Pond 12/14 | 1.63 / 3.12 | ---- / ---- | ---- / ---- |
| Pond 14/15 | 0.98 / 1.88 | 1.06// 2.09 | 1.24 / ---- |
| Pond 15/18 | 0.96 / 1.39 | 1.14 / ---- | 1.49 / ---- |

### Table 5.3. Exit Gradients

| General River Location | Station | Location | Exit Gradient Near Toe |
|---|---|---|---|
| Flood Dike | 23+25 | West side of Pond 11 | 0.0 to 0.3 |
| Flood Dike | 32+00 | West side of Pond 15 | 0.0 to 0.2 |
| Pond Embankments | Pond 14/15 | Downstream toe | 0.5 to 0.9 |
| Pond Embankments | Pond 15/18 | Downstream toe | 0.3 to 0.6 |

# FIGURES



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# RICO-ARGENTINE SITE-OU01

SLOPE STABILITY ANALYSIS SECTIONS - KEY MAP

FIGURE 5.1

# APPENDICES

## Appendix C1 – Slope Stability Analysis Output

## Appendix C2 – Seepage Analysis Output

# APPENDIX C1

# SLOPE STABILITY ANALYSIS OUTPUT

Title: RICO Flood Dike Stability
Comments: Flood Dike Station Sta 18+25
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 11/18/2011

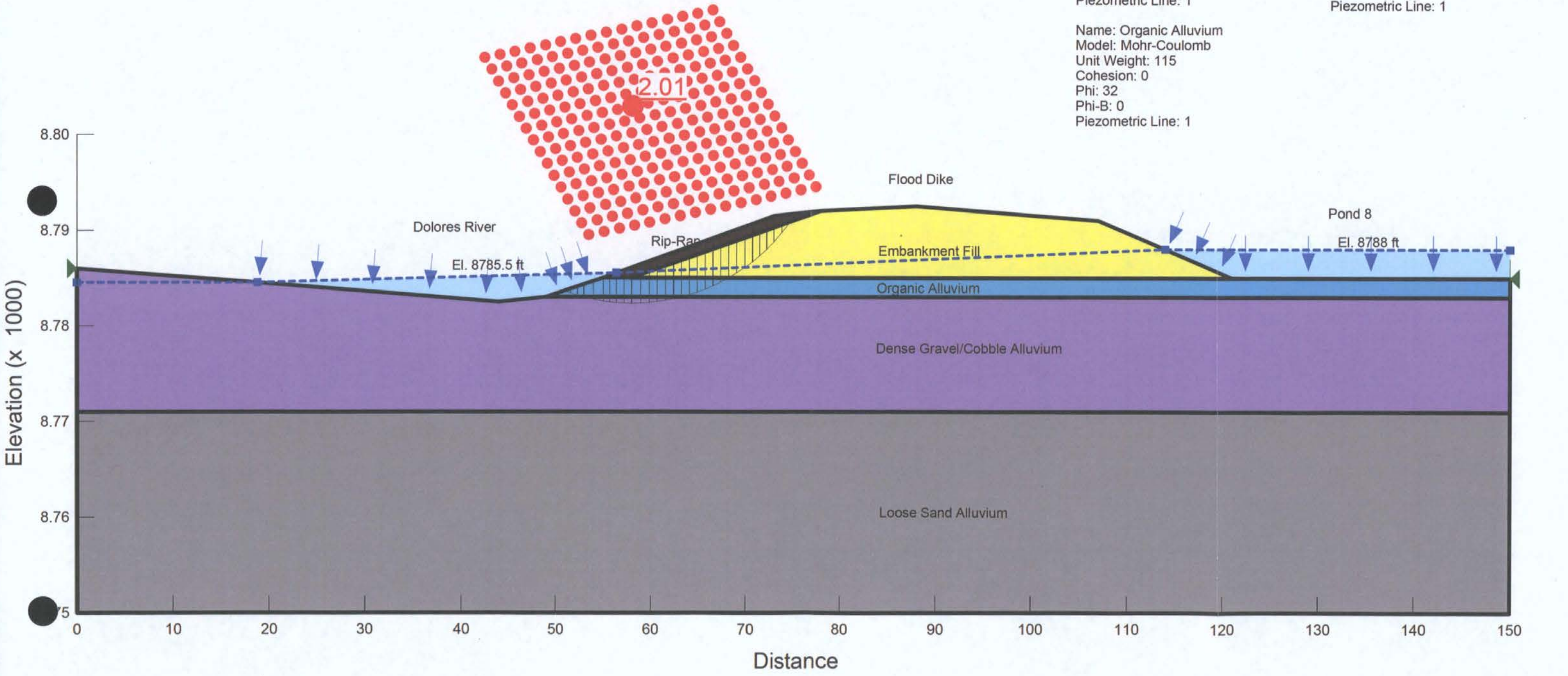
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Organic Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Name: Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1



Title: RICO Interim Drying Facility Dike Stability
Comments: Flood Dike Station Sta 23+25
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 11/18/2011

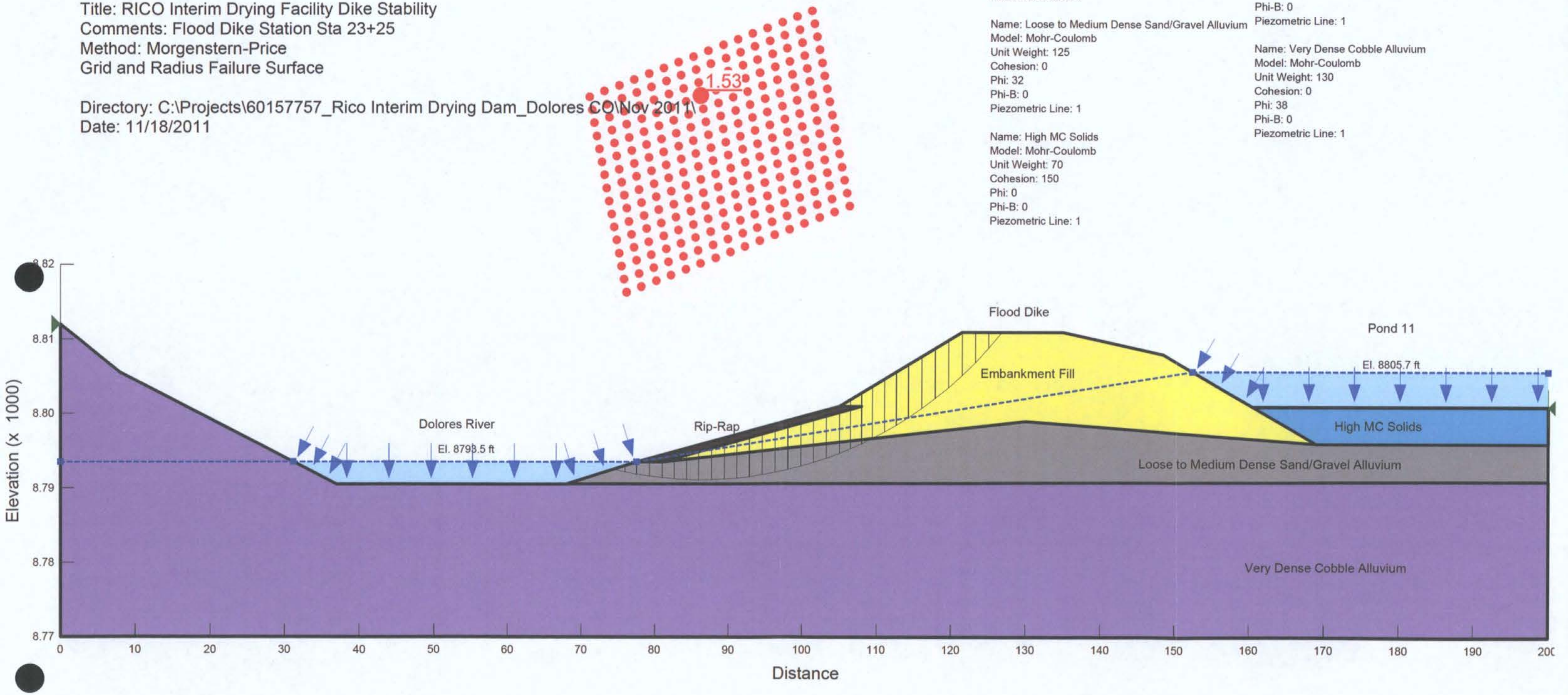
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to Medium Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 125
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Name: Very Dense Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1



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Comments: Flood Dike Station Sta 32+00
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 11/23/2011

Material Properties
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Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 32
Phi-B: 0
Piezometric Line: 1

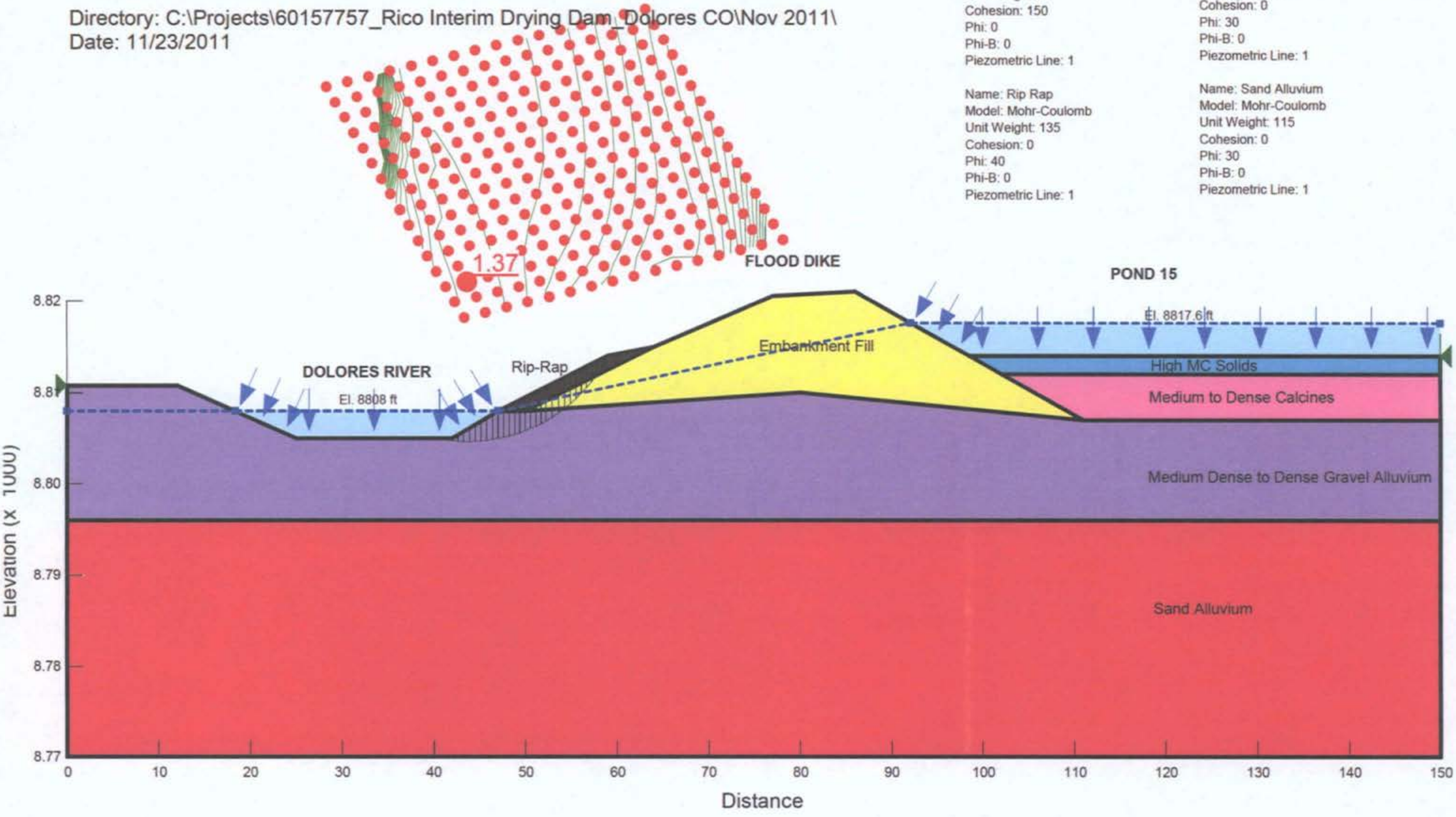
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: Medium to Dense G[illegible] Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Name: Medium to Loose Calcines
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



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Comments: Flood Dike Station Sta 32+00
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 11/23/2011

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Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 32
Phi-B: 0
Piezometric Line: 1

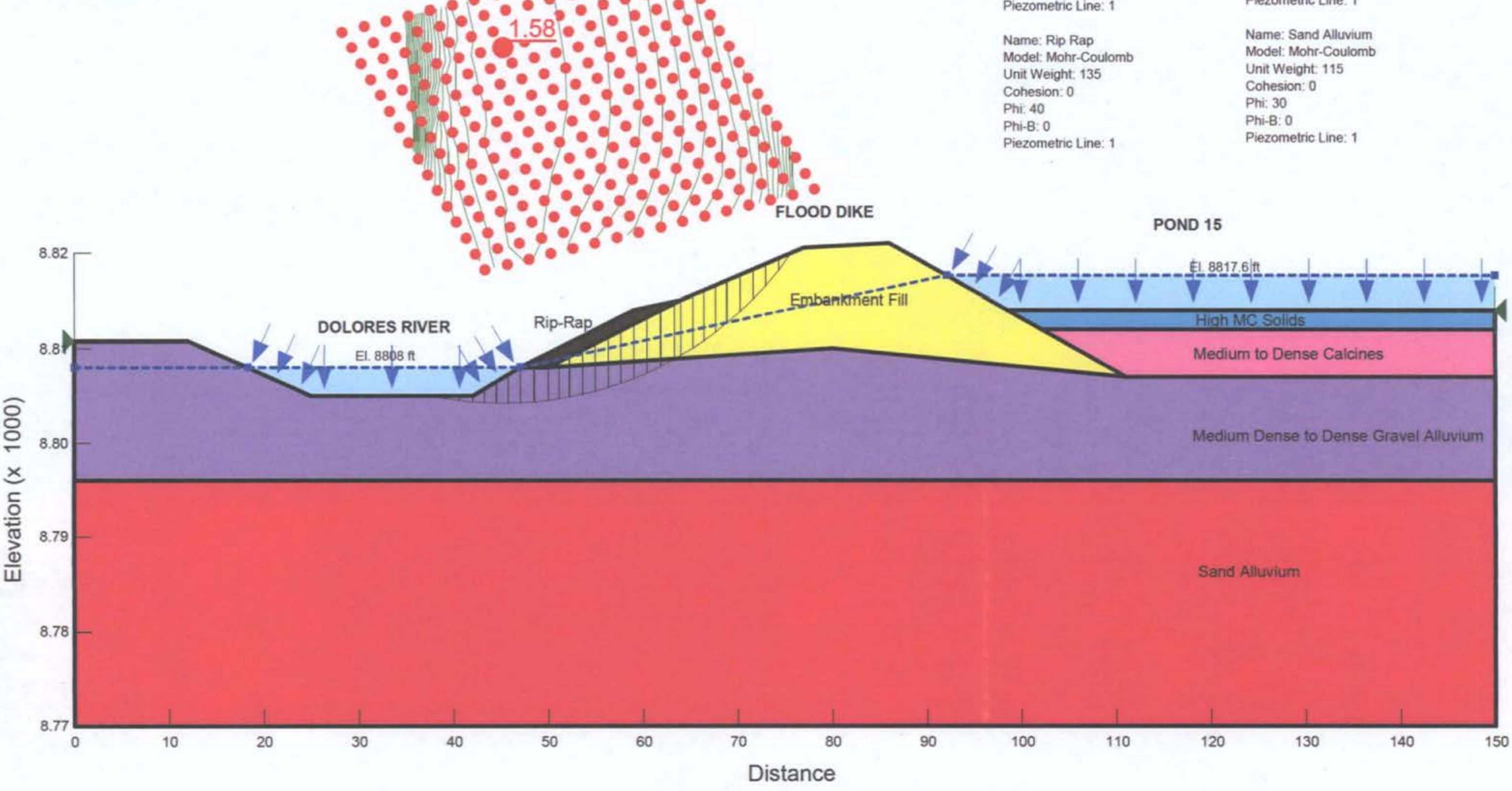
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Name: Medium to Den[illegible]ravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Name: Medium to Loose Calcines
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



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Comments: Flood Dike Station Sta 35+00
Method: Morgenstern-Price
Grid and Radius Failure Surface

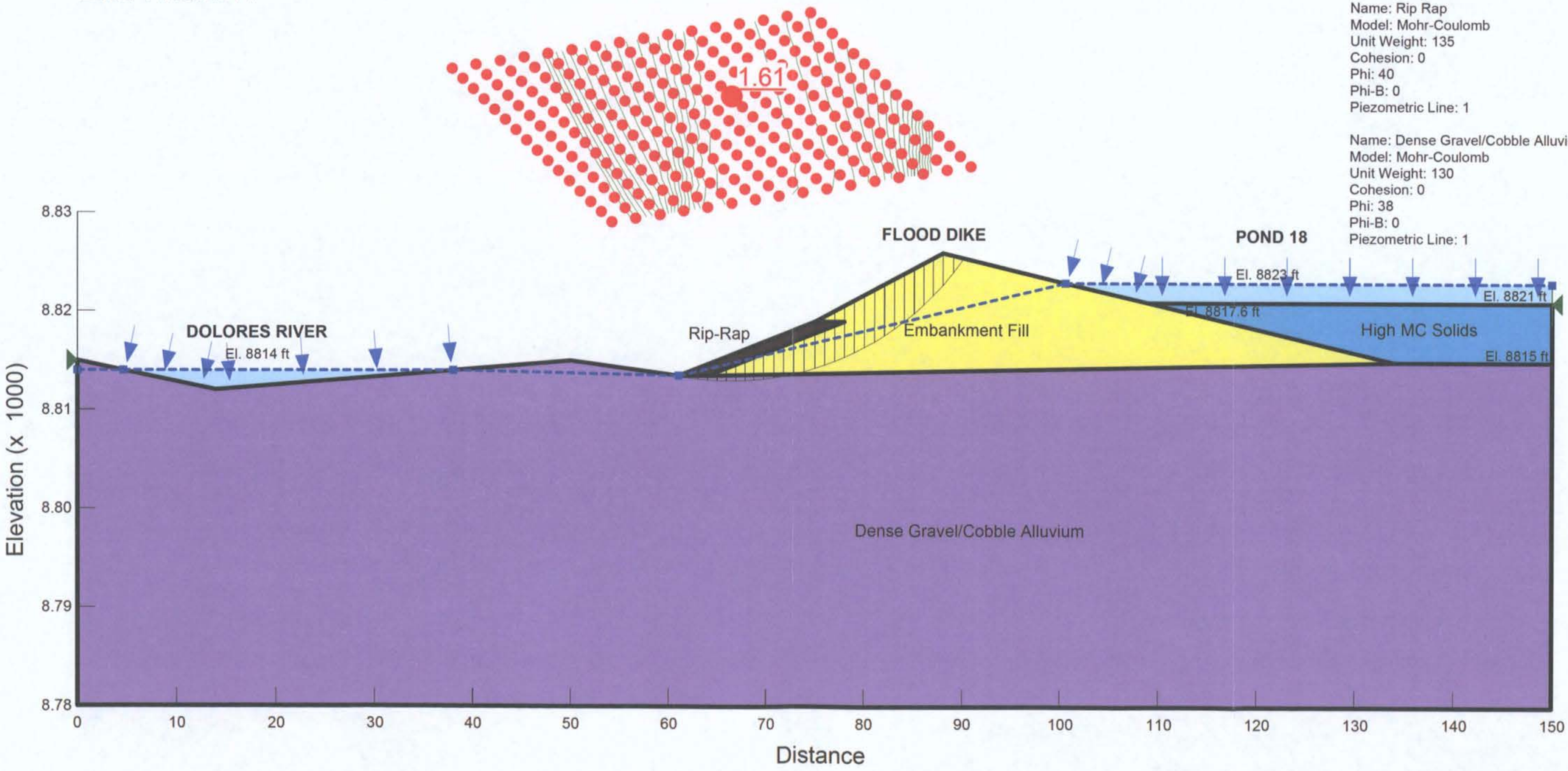
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 11/23/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Name: Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1



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Comments: Flood Dike Station Sta 37+50
Method: Morgenstern-Price
Grid and Radius Failure Surface

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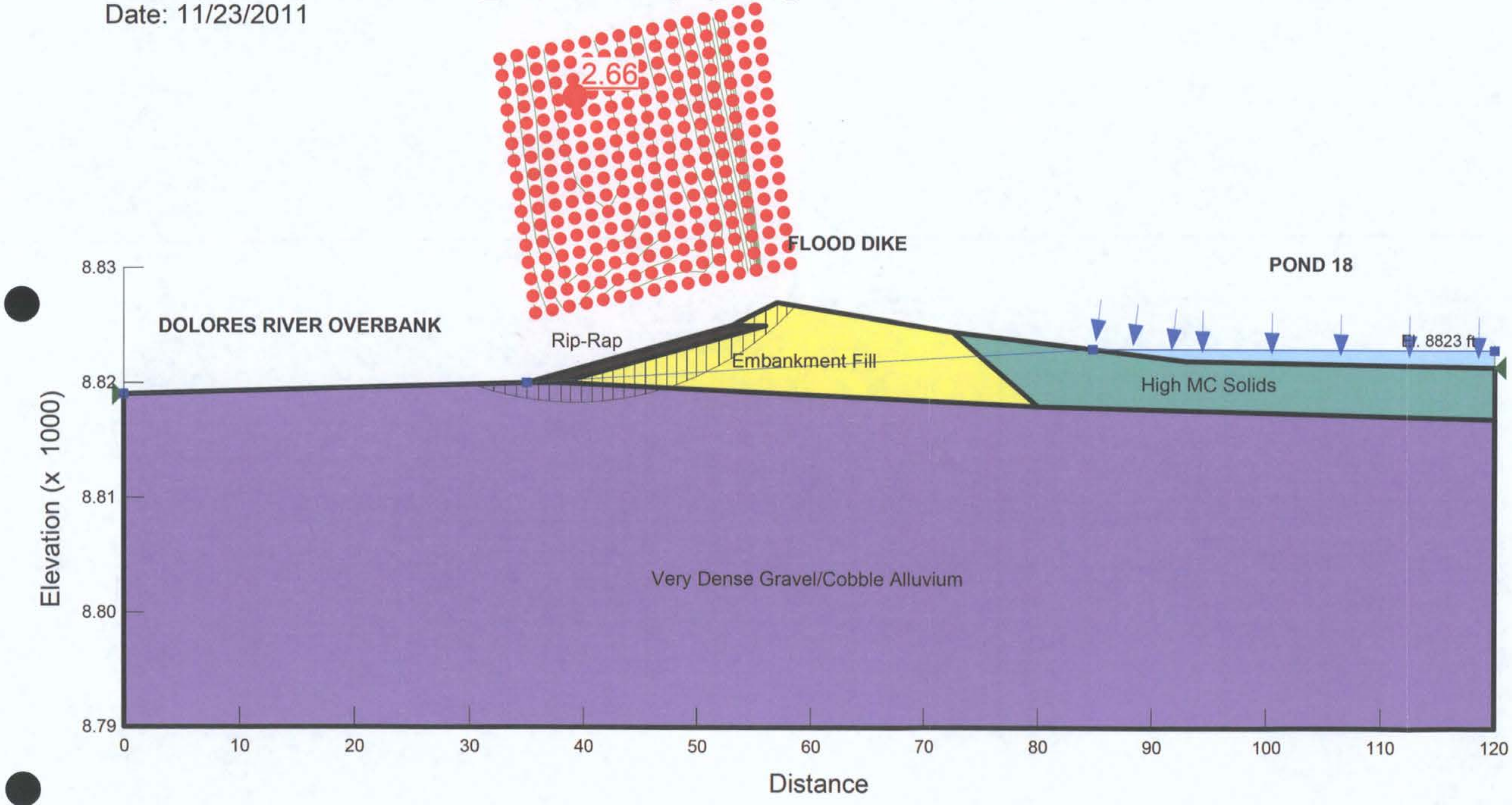
Date: 11/23/2011



Material Properties
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Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Name: Very Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

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Comments: Flood Dike Station Sta 44+50
Method: Morgenstern-Price
Grid and Radius Failure Surface

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Date: 11/23/2011

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Unit Weight: 125
Cohesion: 0
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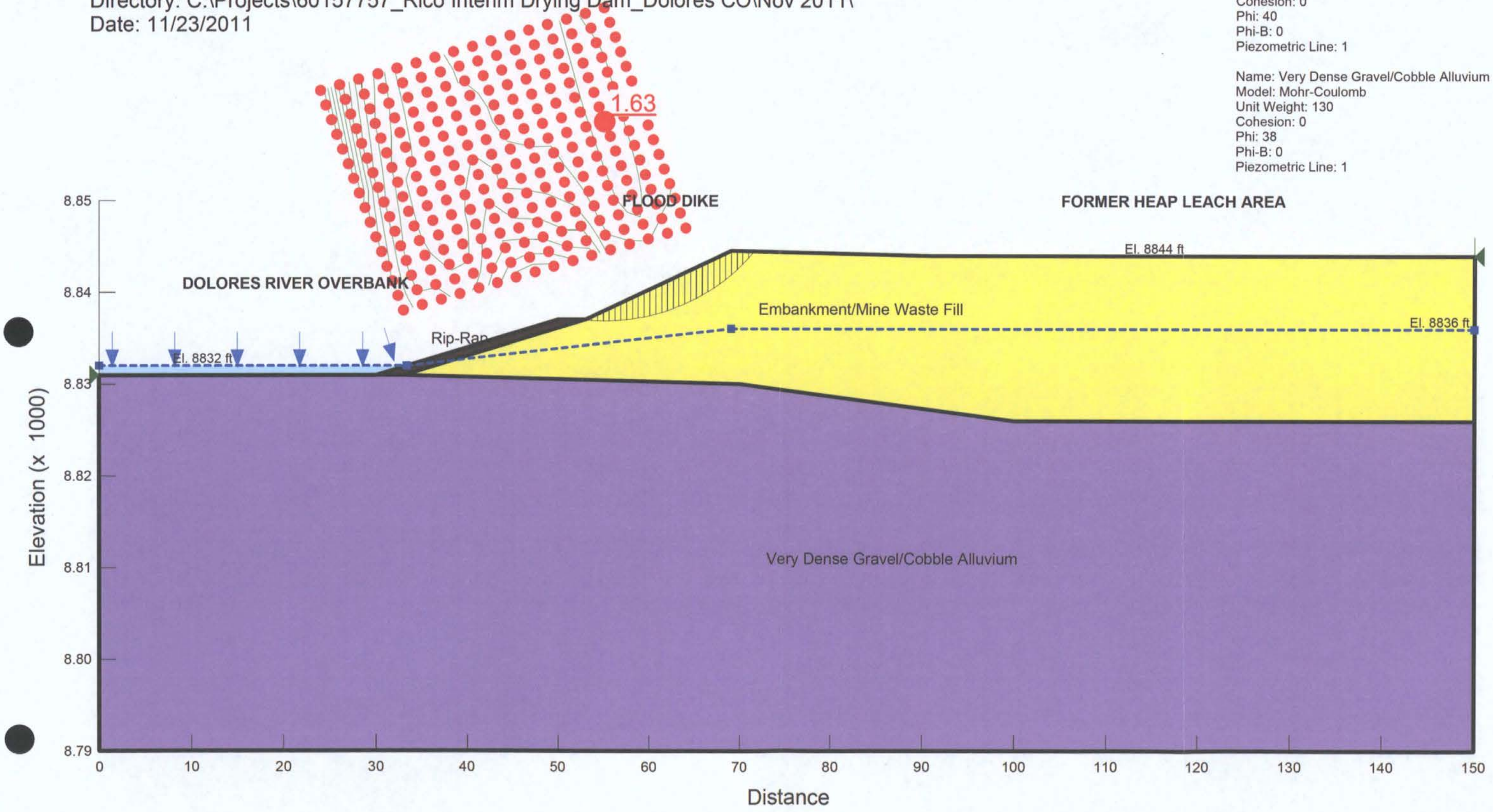
Phi-B: 0
Piezometric Line: 1

Name: Rip Rap
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 0
Phi: 40
Phi-B: 0
Piezometric Line: 1

Name: Very Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 6/7
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: V. Dense to M. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
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Phi-B: 0
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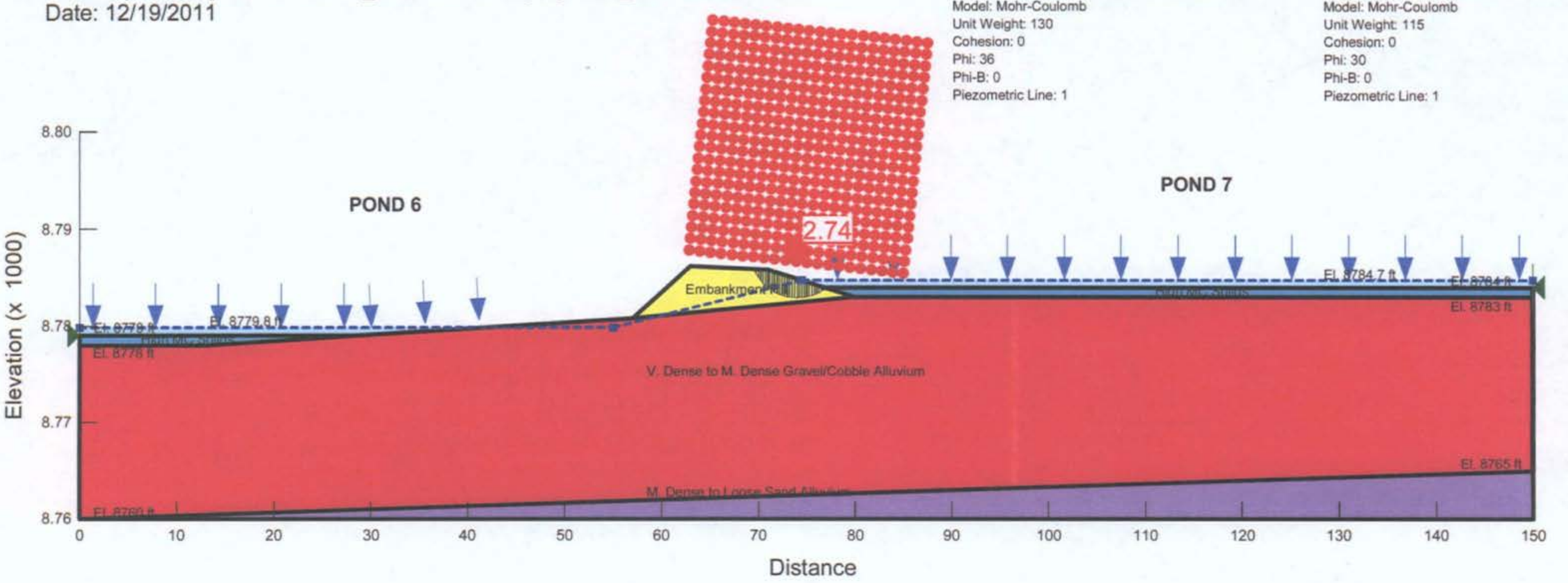

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Comments: Pond 6/7
Method: Morgenstern-Price
Grid and Radius Failure Surface

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Date: 12/19/2011

Material Properties
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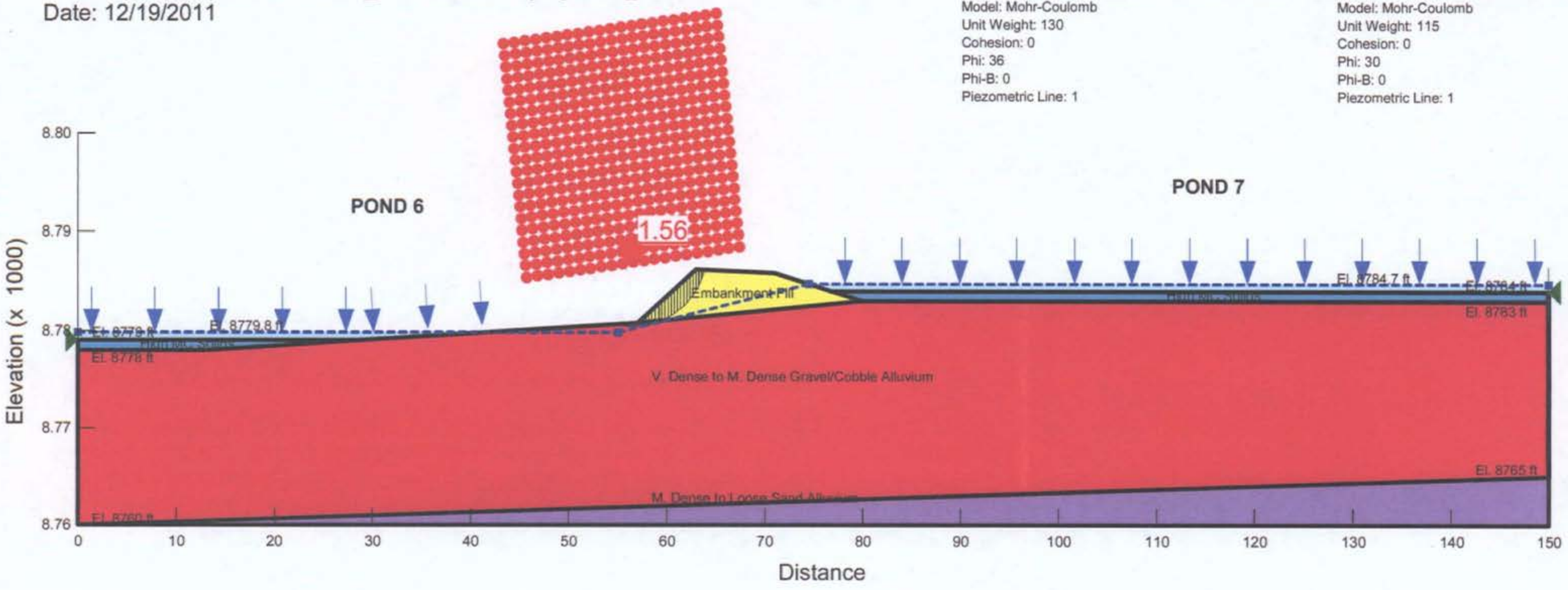
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: V. Dense to M. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 6/7
Method: Morgenstern-Price
Grid and Radius Failure Surface

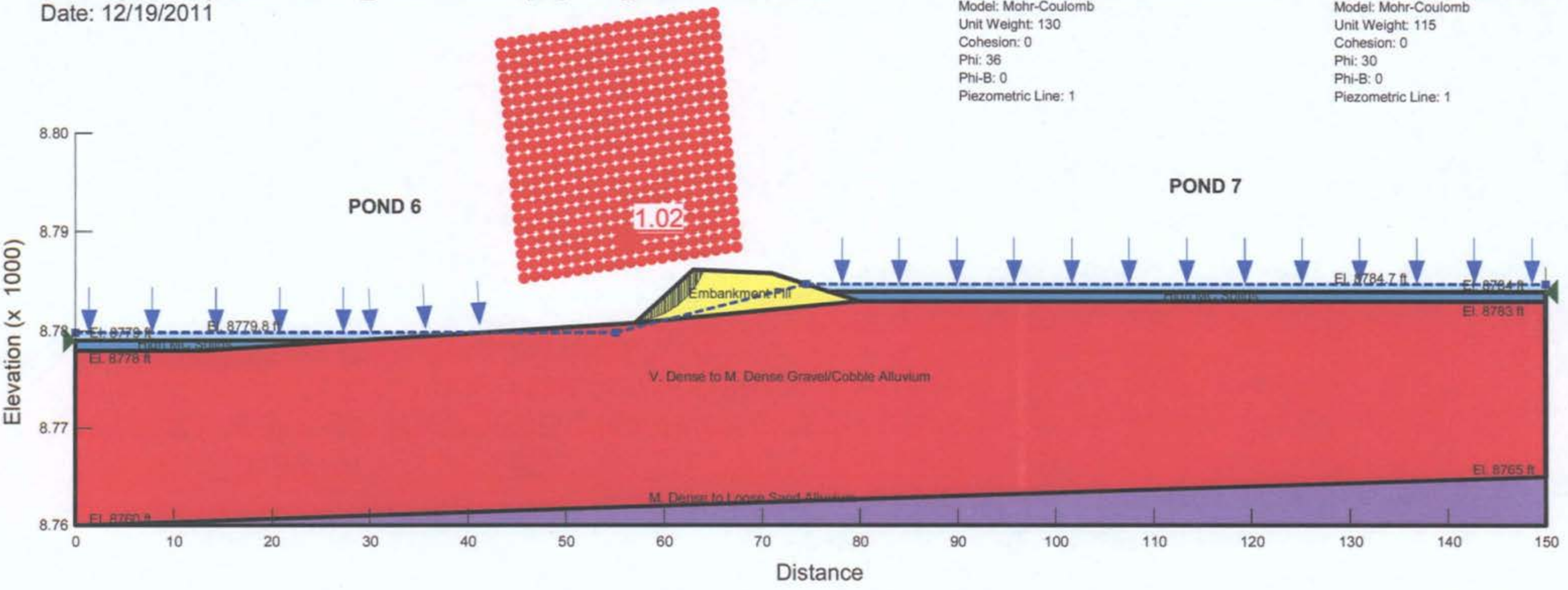
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: V. Dense to M. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 6/7
Method: Morgenstern-Price
Grid and Radius Failure Surface

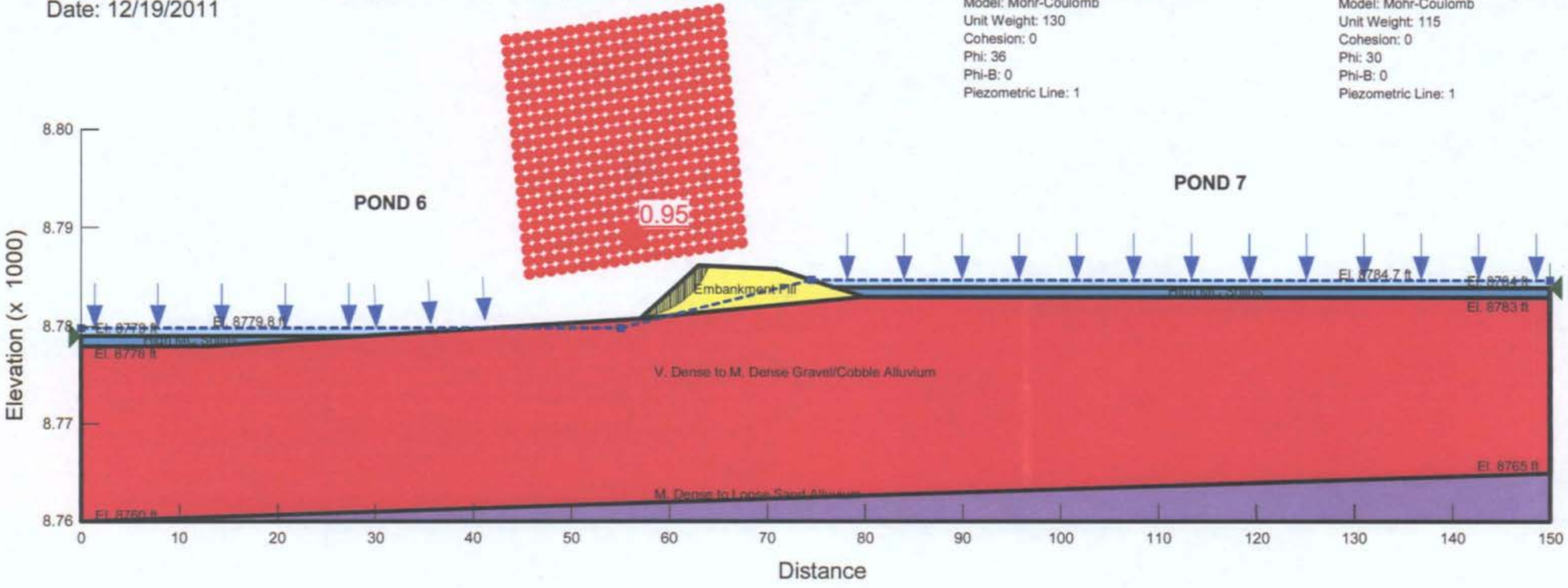
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: V. Dense to M. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 7/8
Method: Morgenstern-Price
Grid and Radius Failure Surface

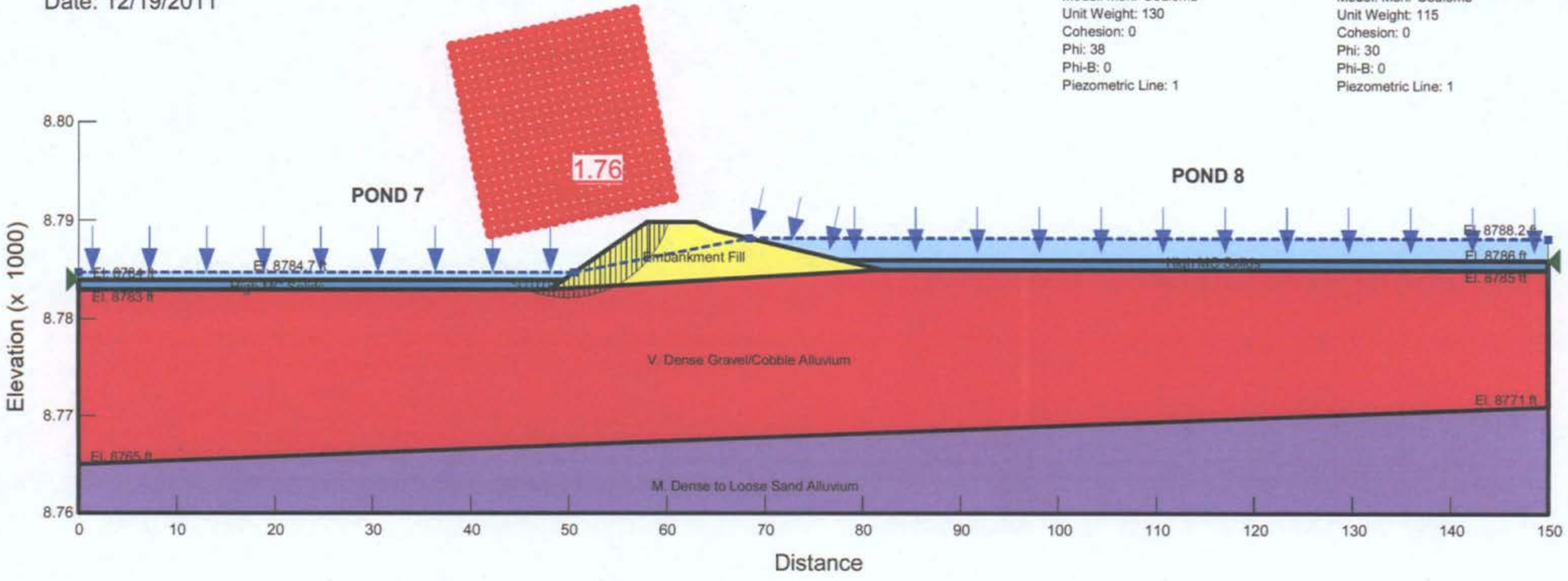
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: V. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 7/8
Method: Morgenstern-Price
Grid and Radius Failure Surface

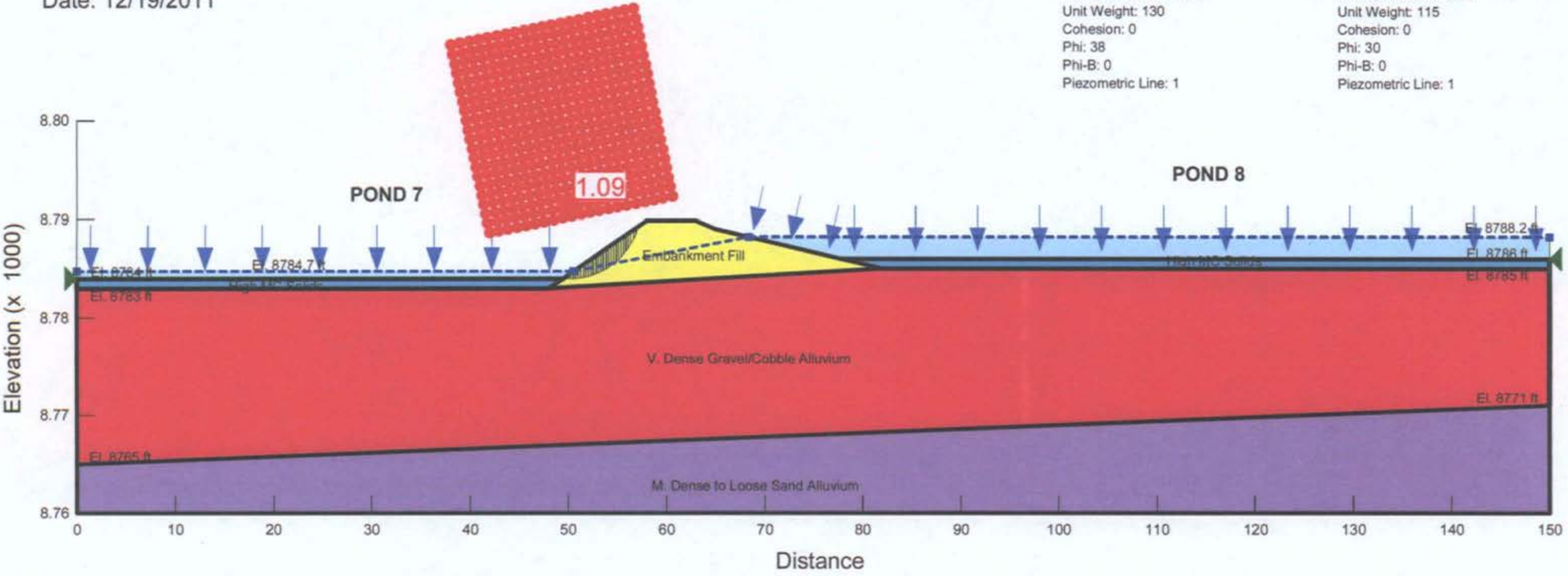
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: V. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 7/8
Method: Morgenstern-Price
Grid and Radius Failure Surface

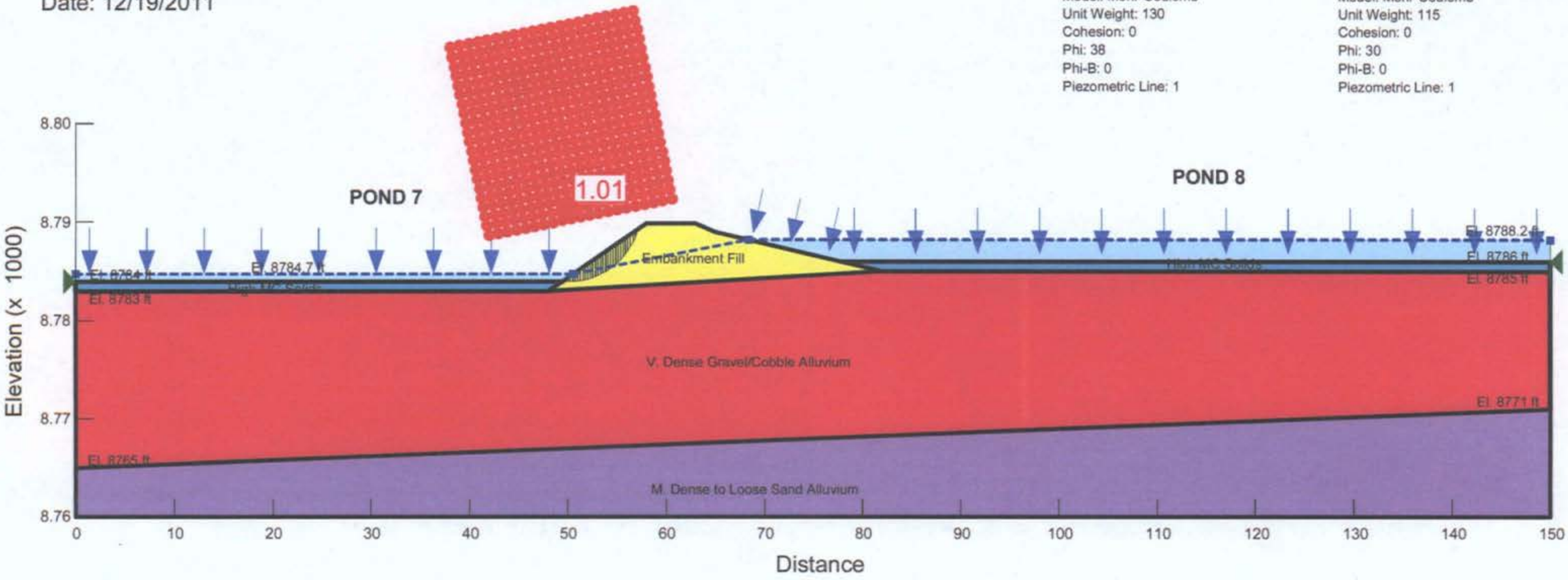
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: V. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 7/8
Method: Morgenstern-Price
Grid and Radius Failure Surface

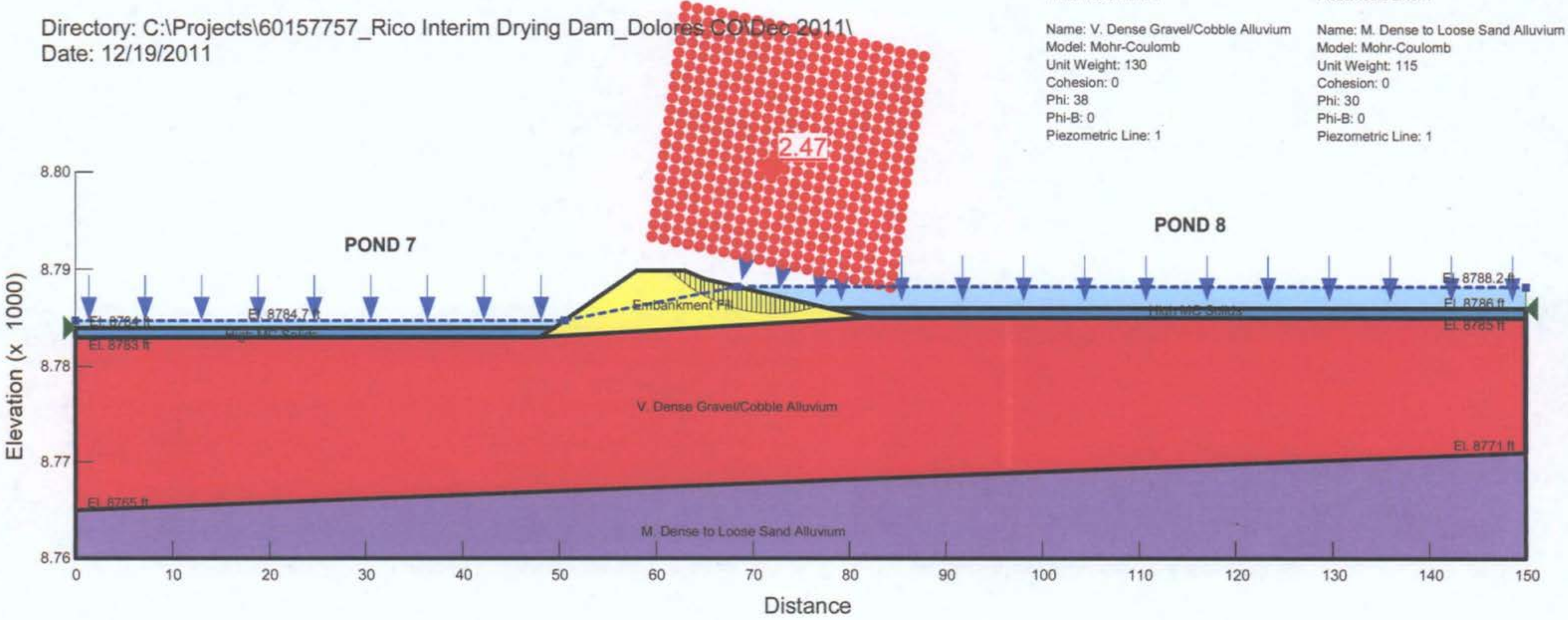
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: V. Dense Gravel/Cobble Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 8/10
Method: Morgenstern-Price
Grid and Radius Failure Surface

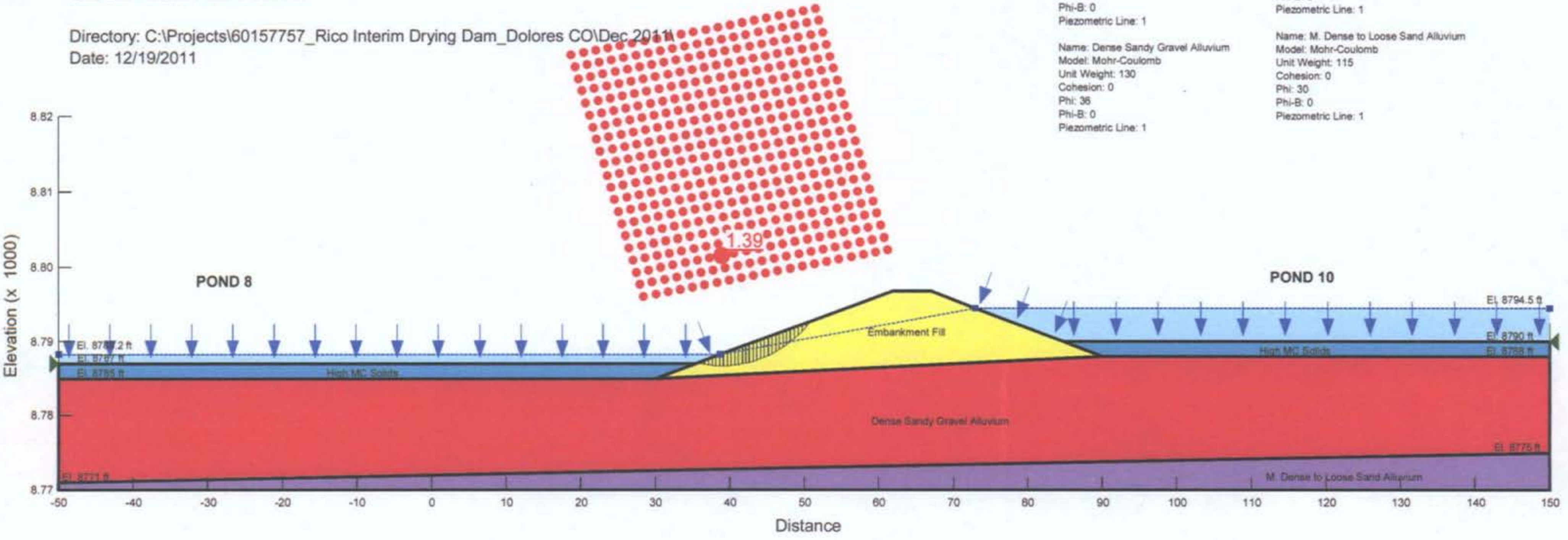
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Dense Sandy Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

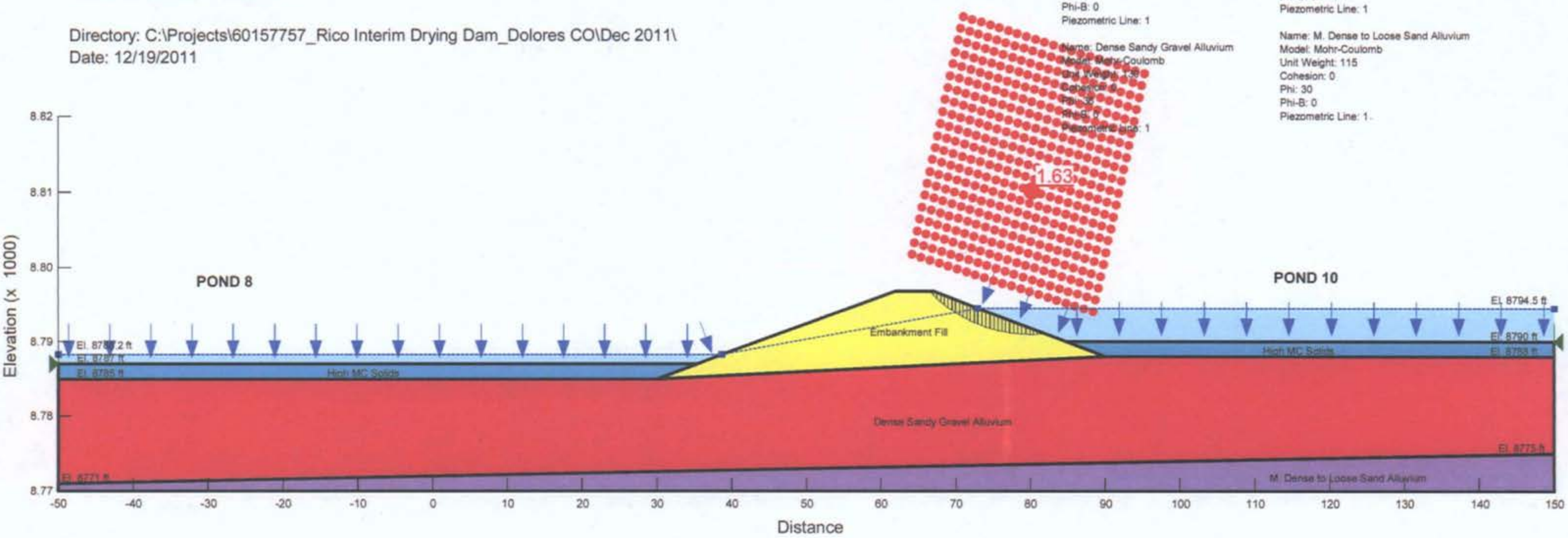
Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 8/10
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011



Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Dense Sandy Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 35
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1.

Title: RICO Flood Dike Stability
Comments: Pond 9/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

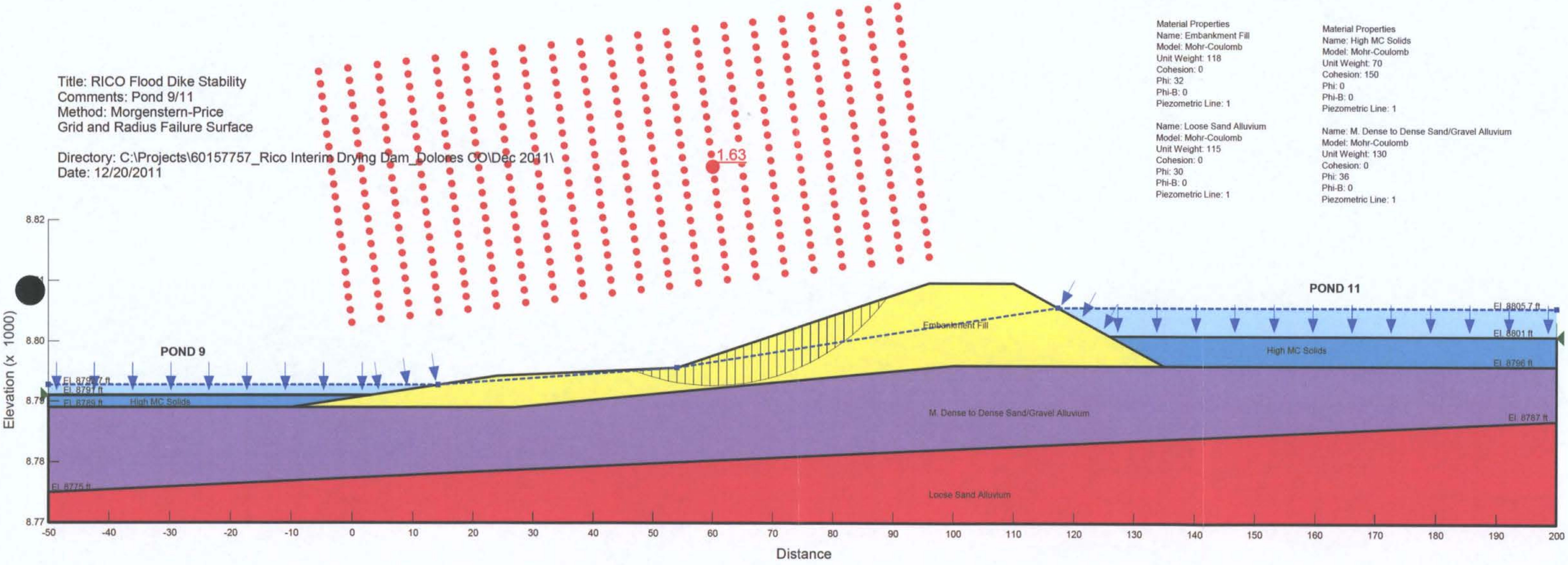
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/20/2011

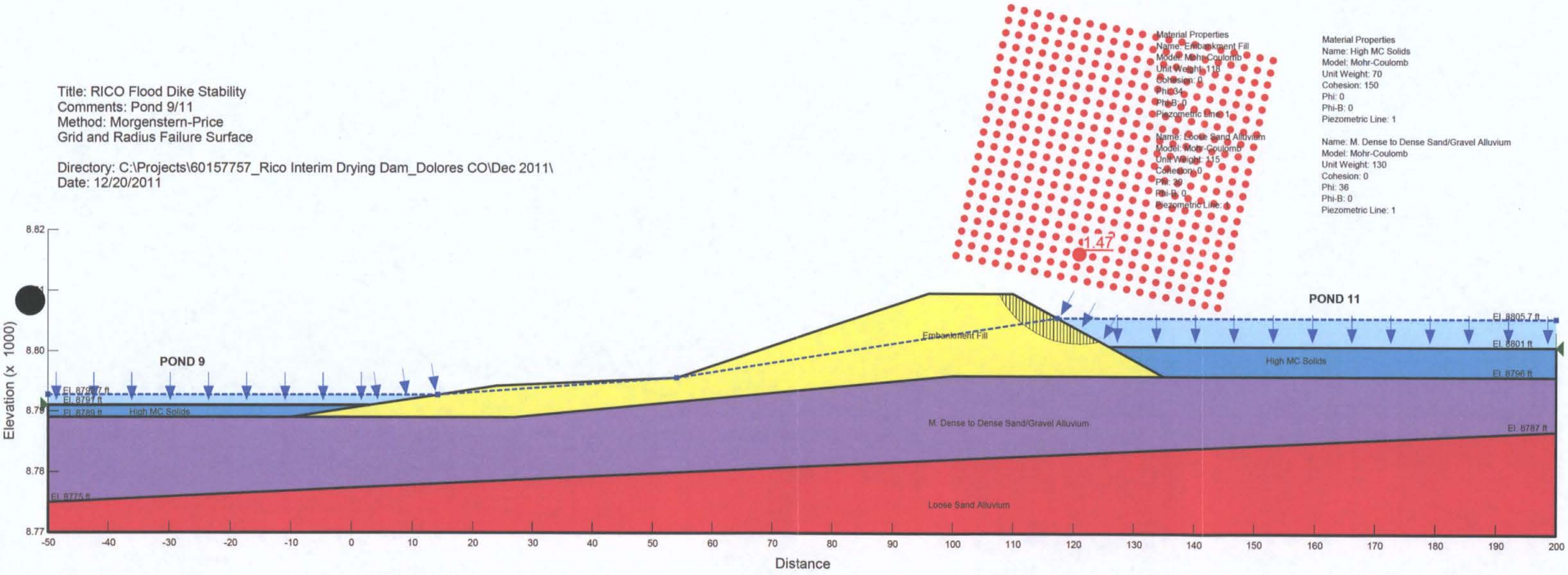
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1





Title: RICO Flood Dike Stability
Comments: Pond 9/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/20/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

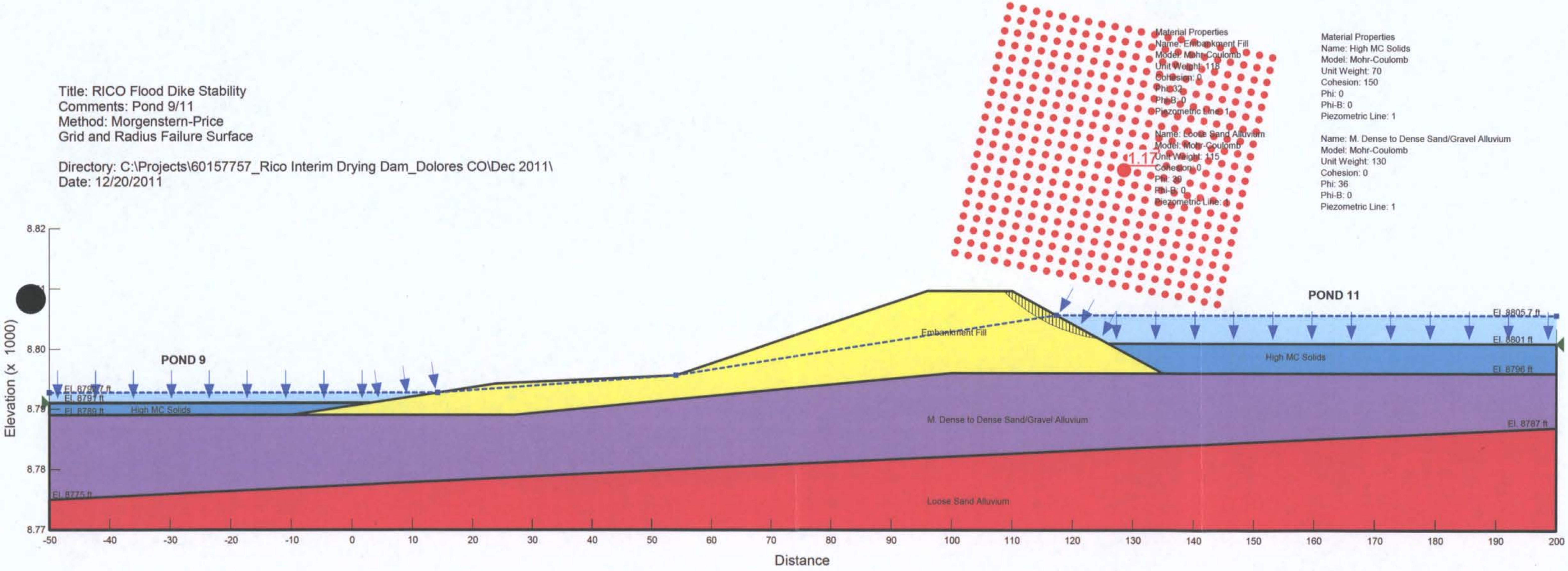
Name: Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Title: RICO Flood Dike Stability
Comments: Pond 9/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/20/2011



Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

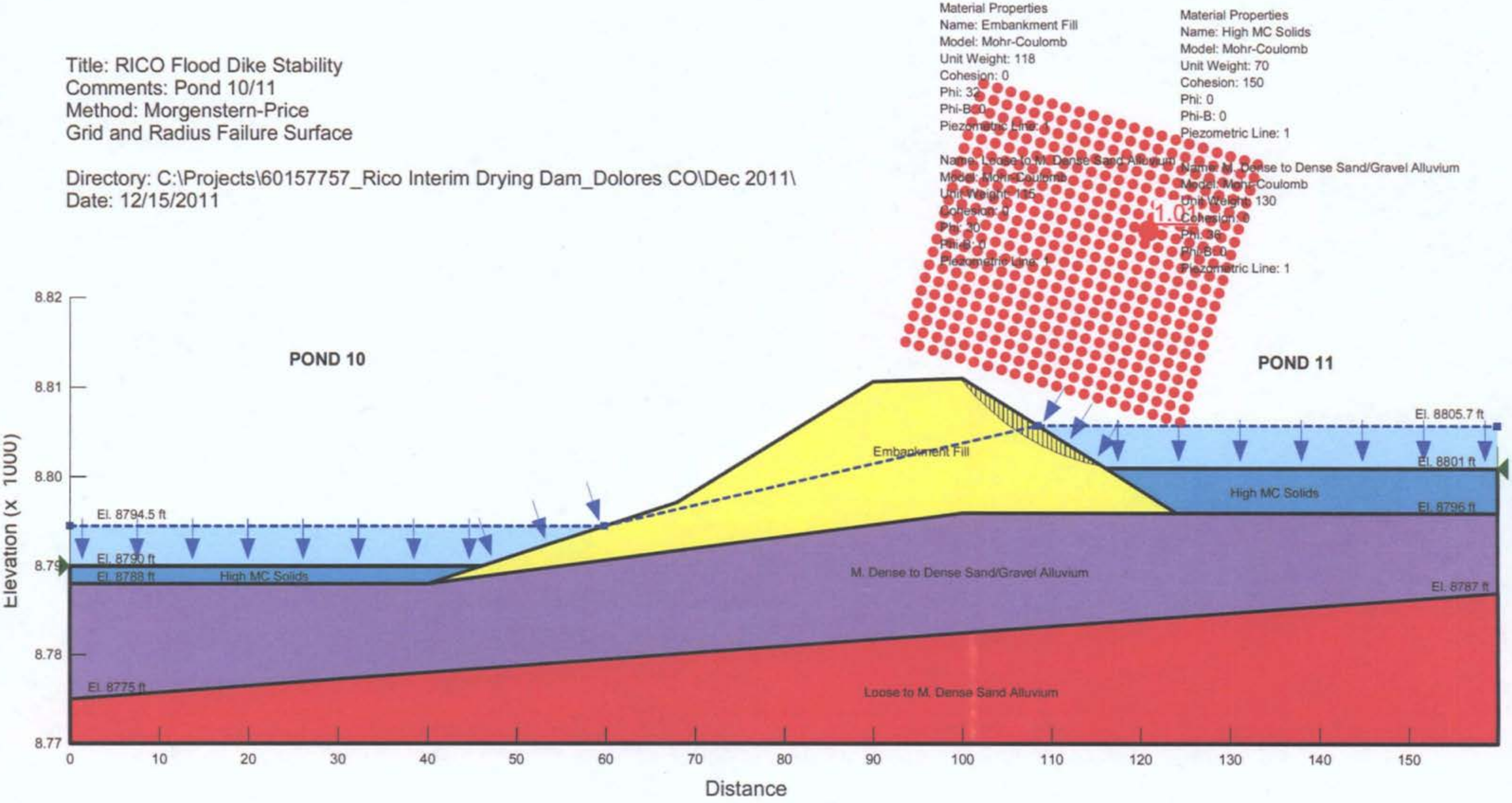
Name: Loose Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Title: RICO Flood Dike Stability
Comments: Pond 10/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/15/2011



Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Title: RICO Flood Dike Stability
Comments: Pond 10/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

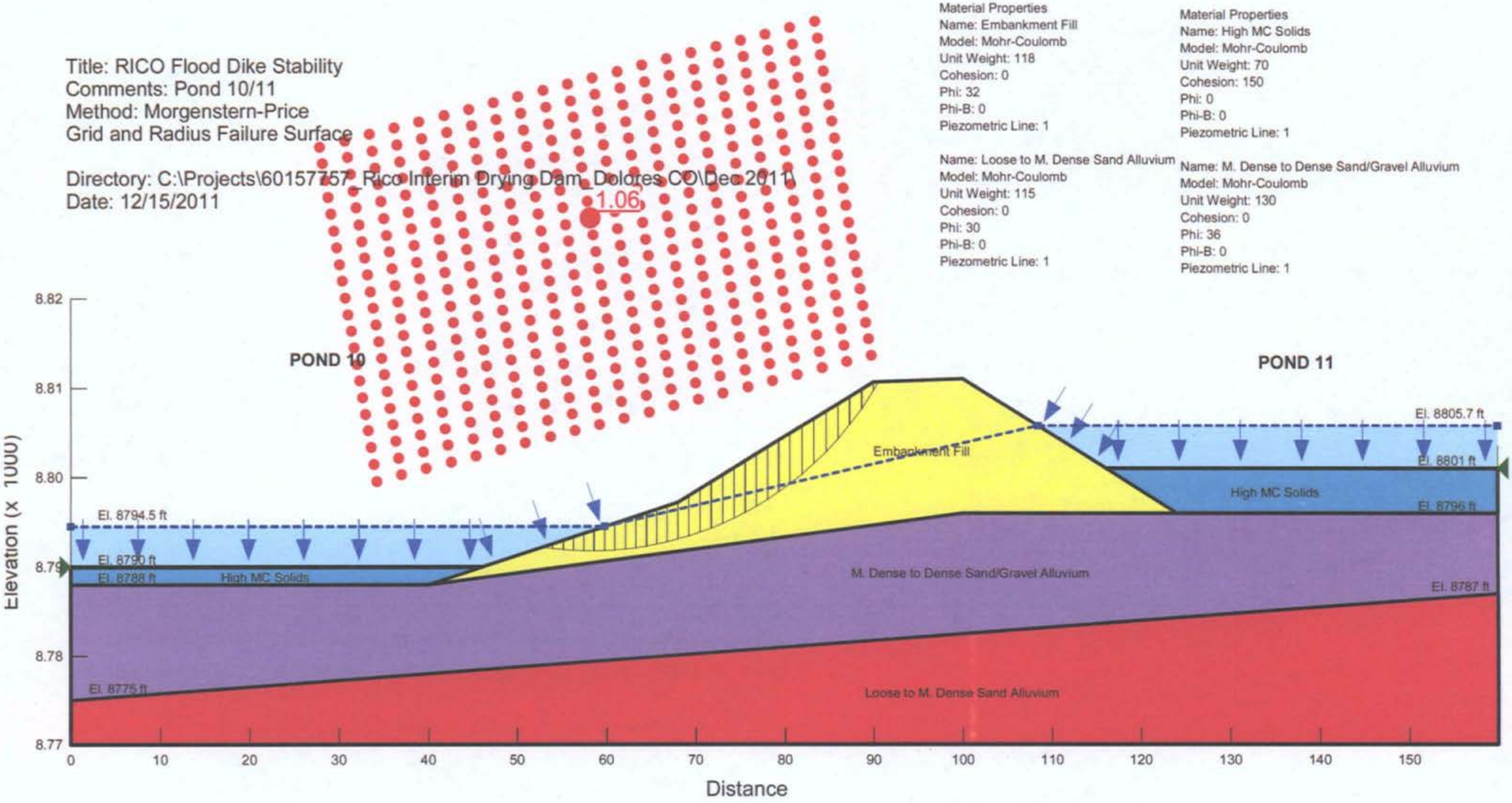
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/15/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

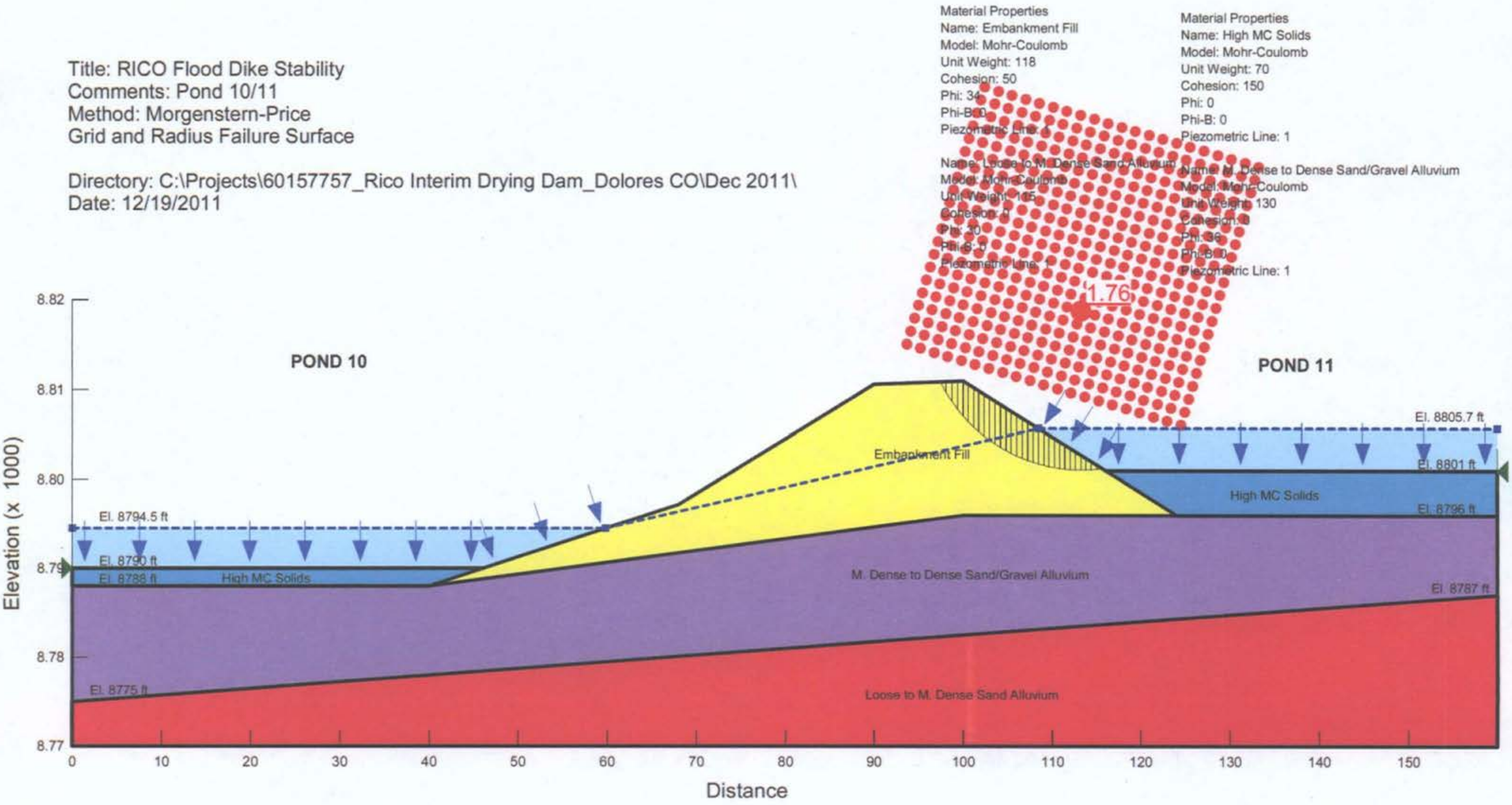
Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 10/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011



Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 34
Phi-B: 0
Piezometric Line: 1

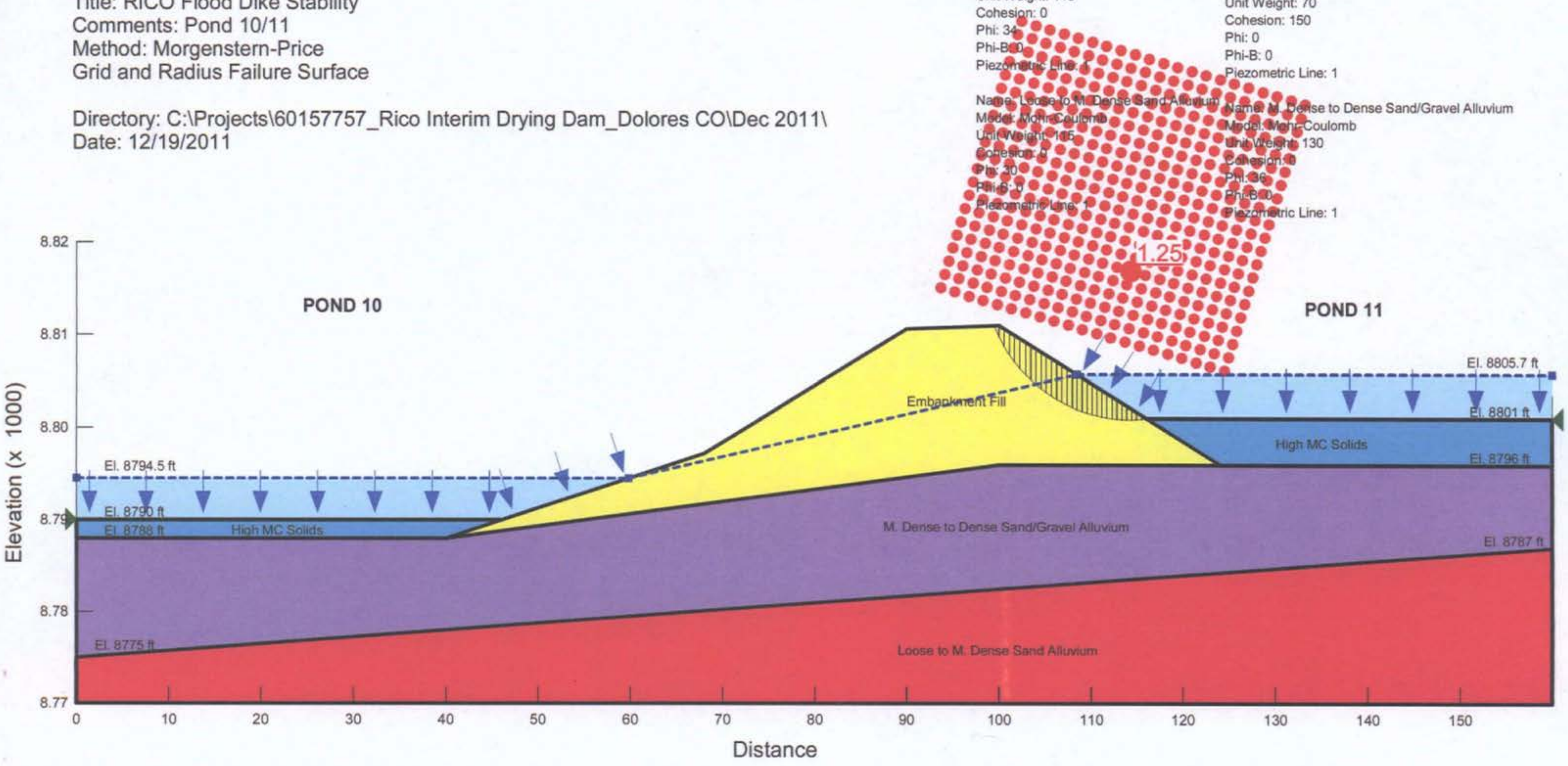
Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Title: RICO Flood Dike Stability
Comments: Pond 10/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

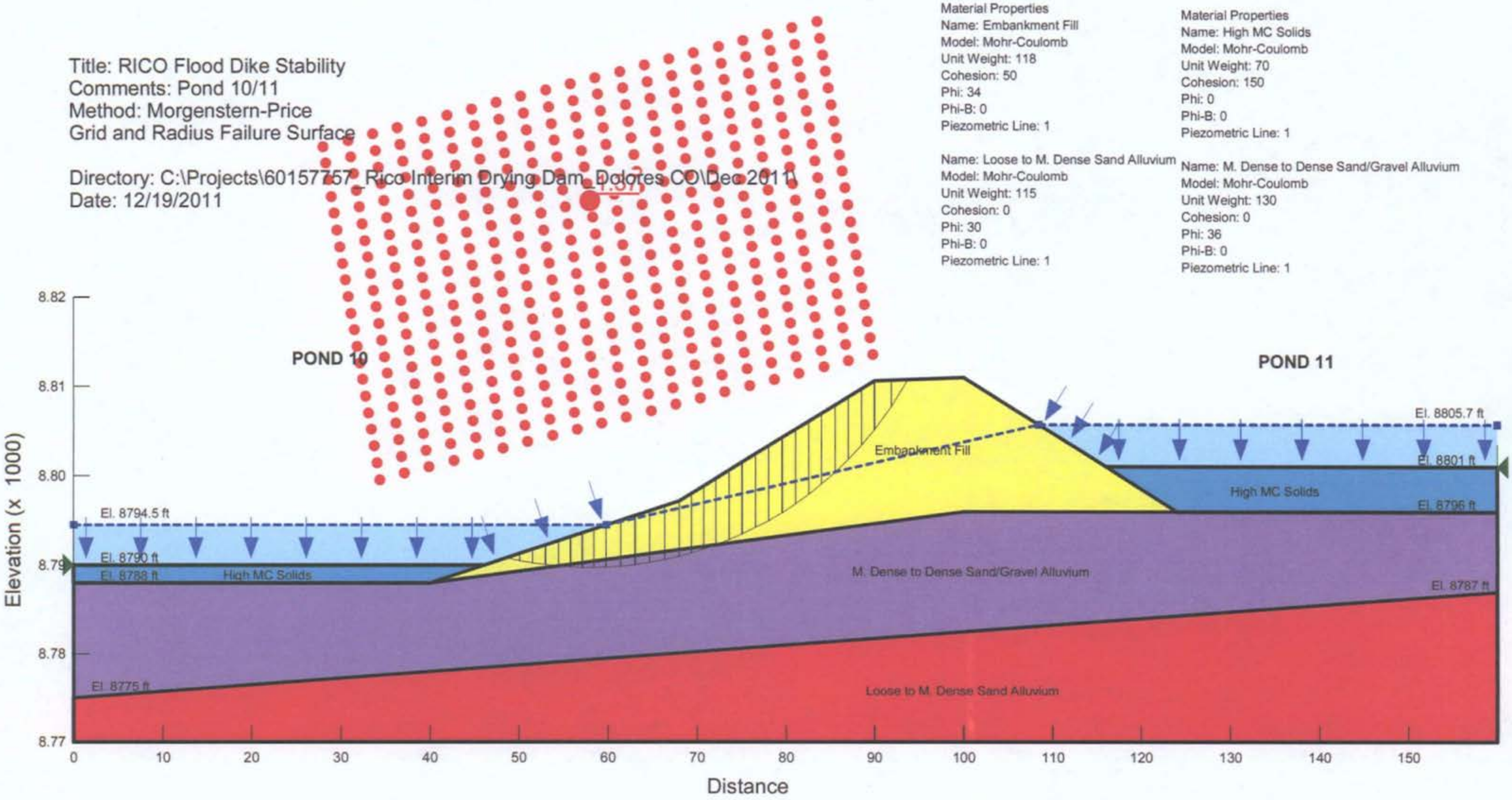
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011


Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 10/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

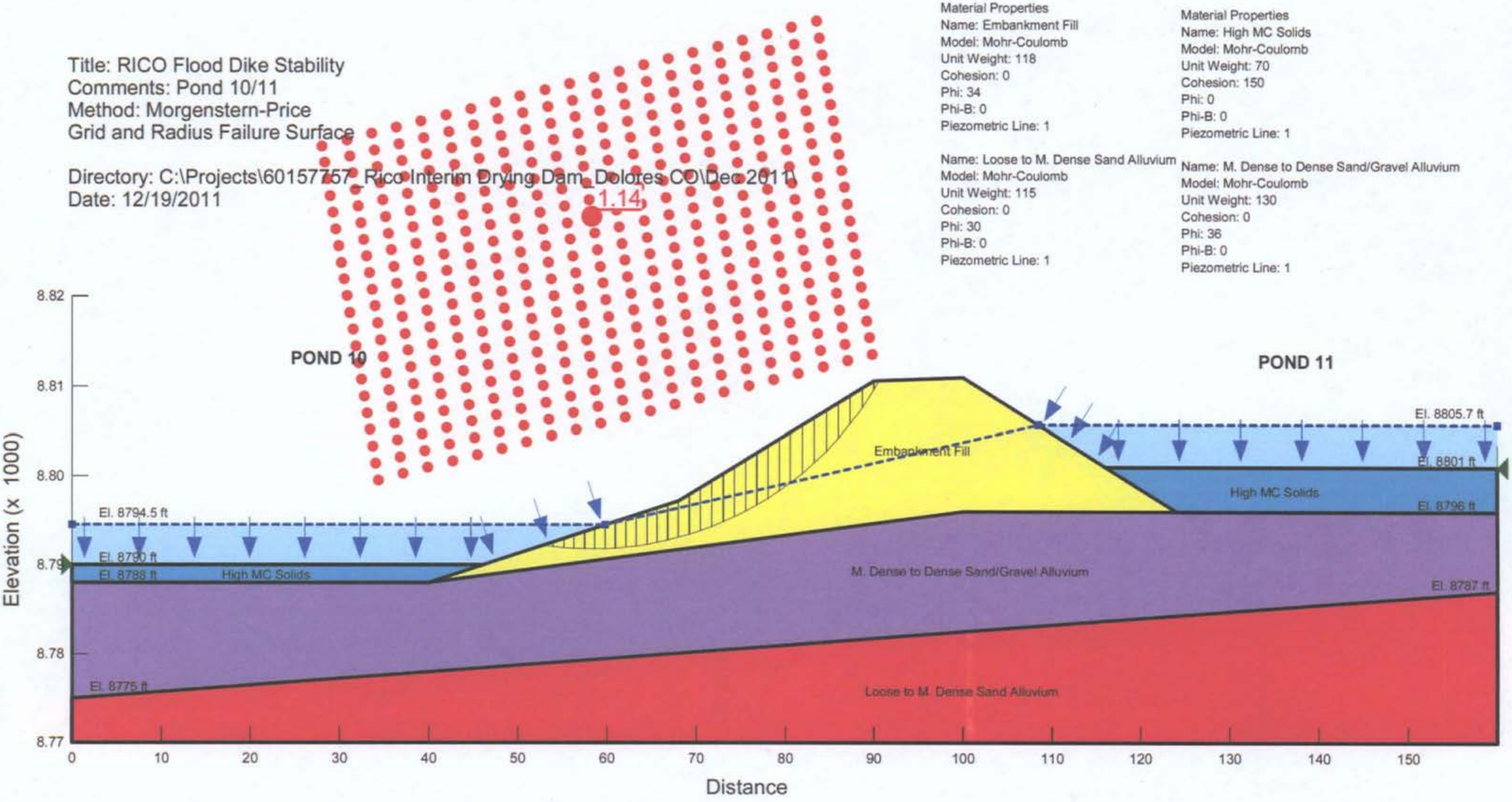
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 10/11
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

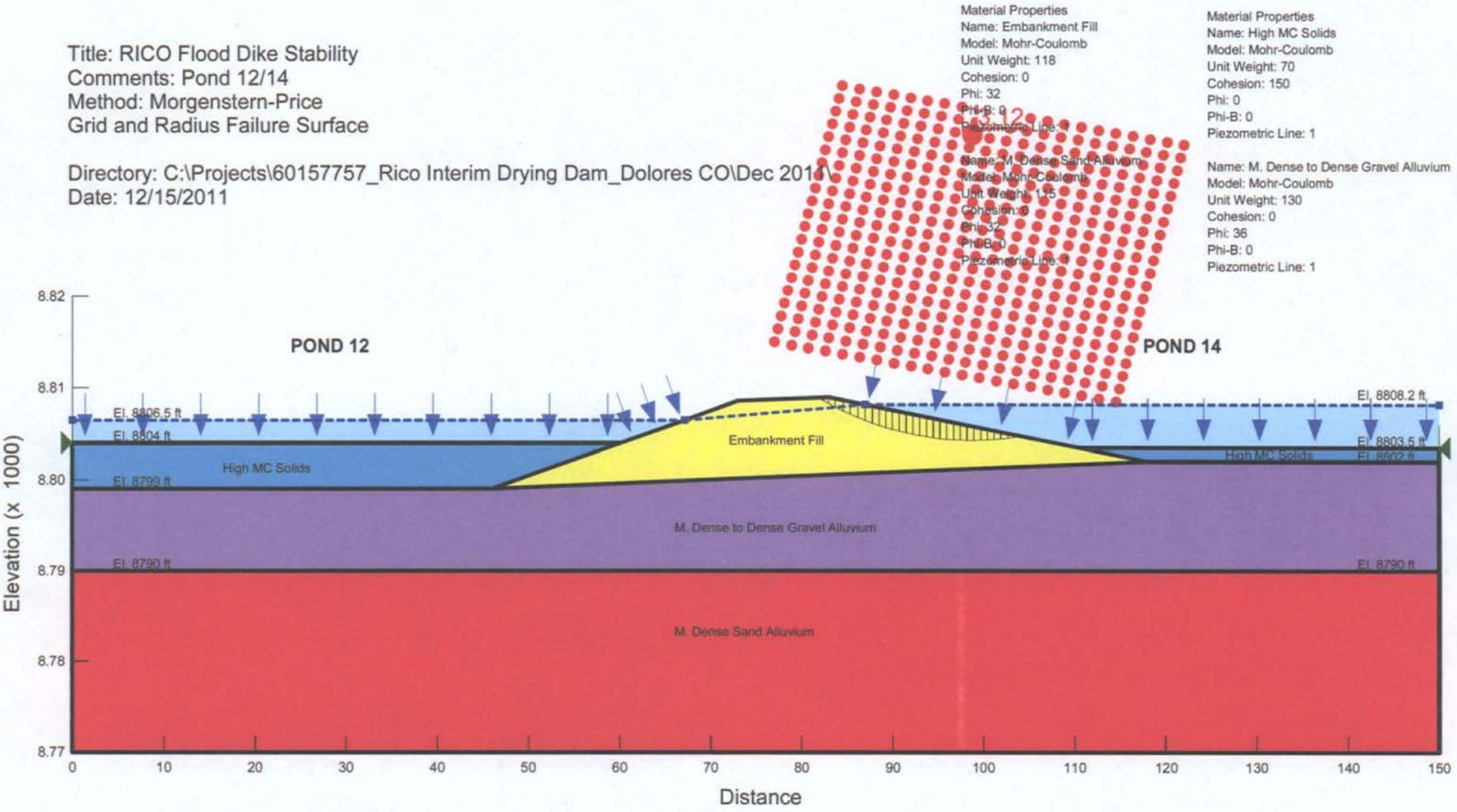
Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Title: RICO Flood Dike Stability
Comments: Pond 12/14
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/15/2011



Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1

Title: RICO Flood Dike Stability
Comments: Pond 12/14
Method: Morgenstern-Price
Grid and Radius Failure Surface

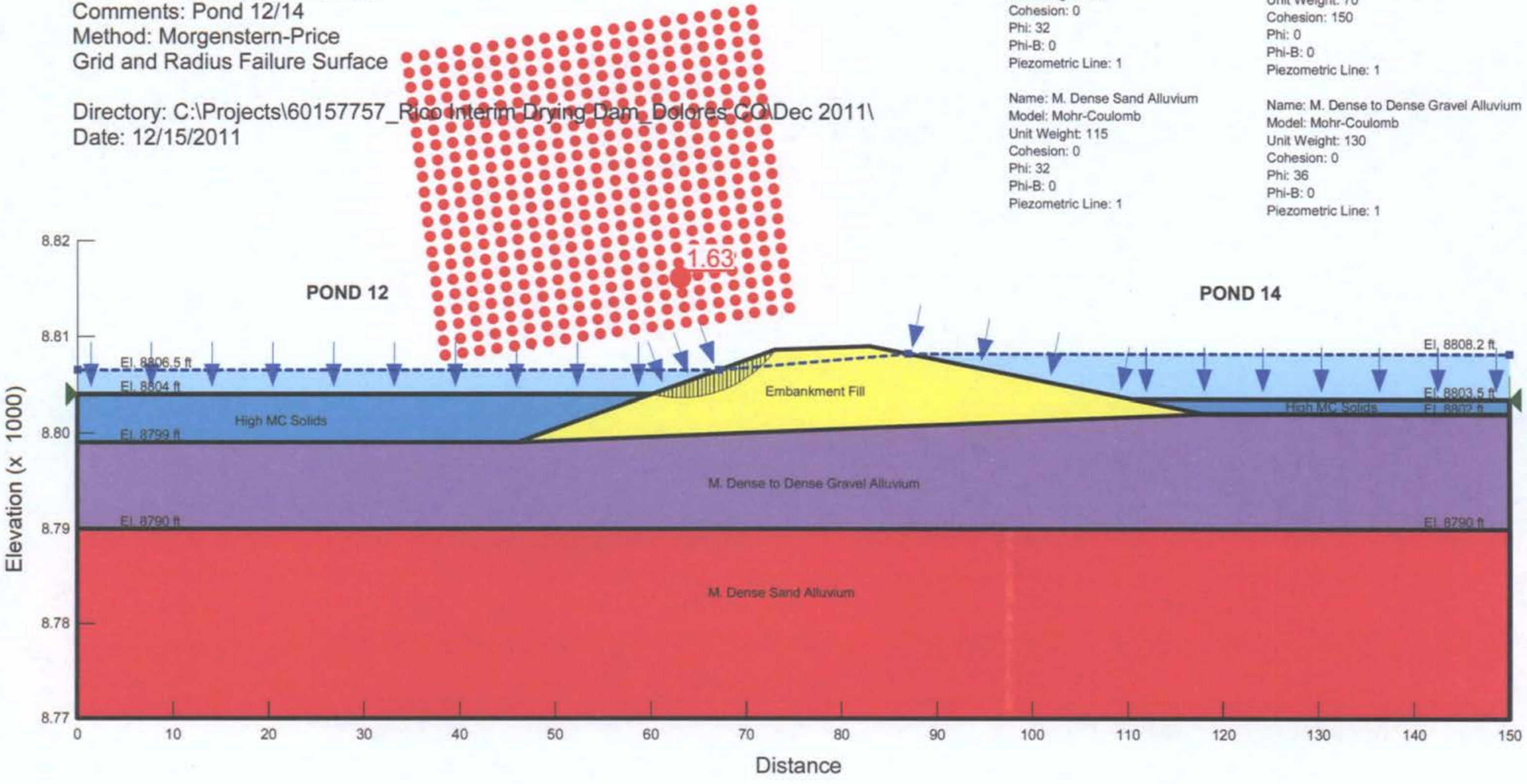
Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/15/2011

Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 14/15
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/16/2011

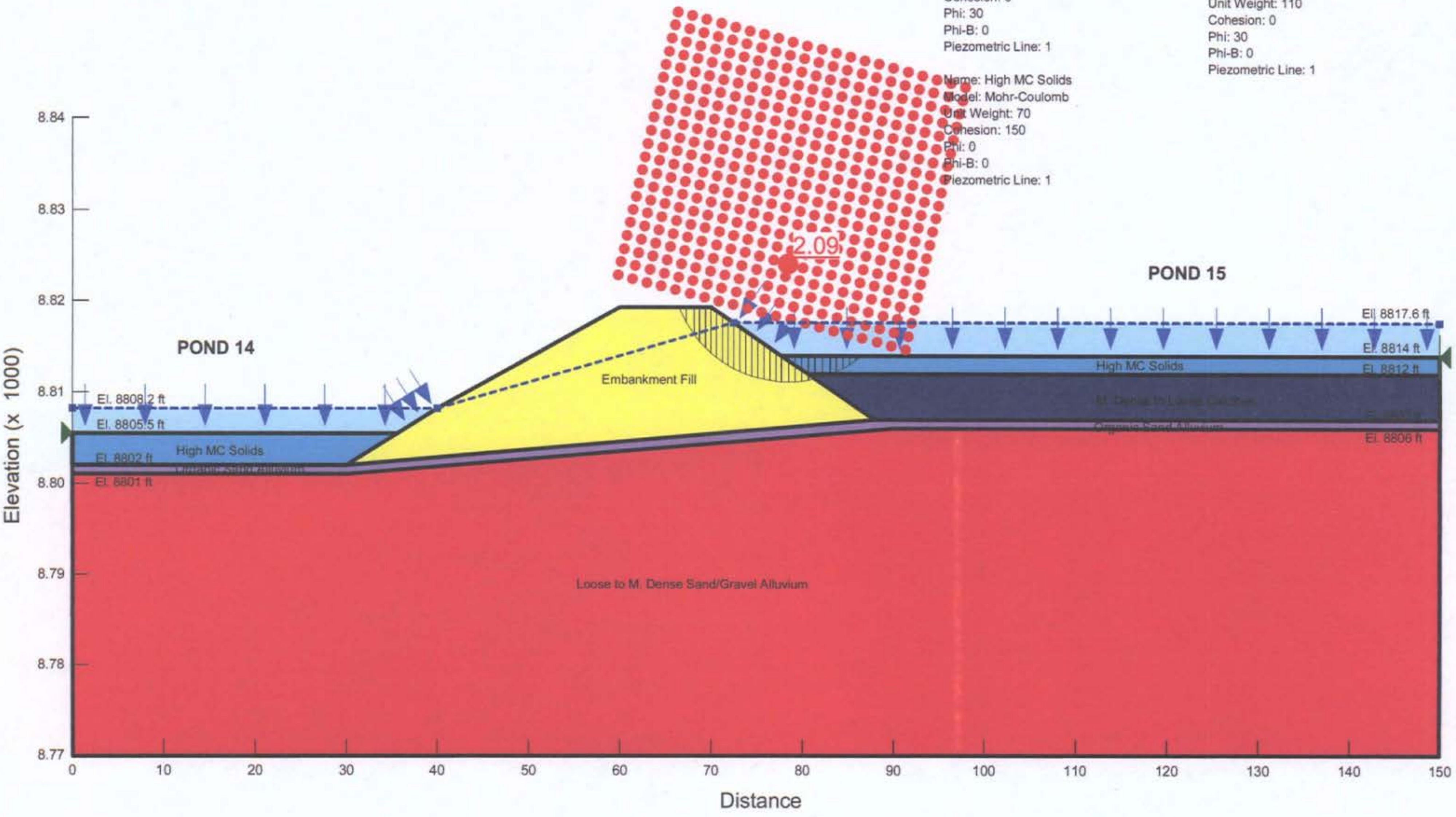
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Organic Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 14/15
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/16/2011

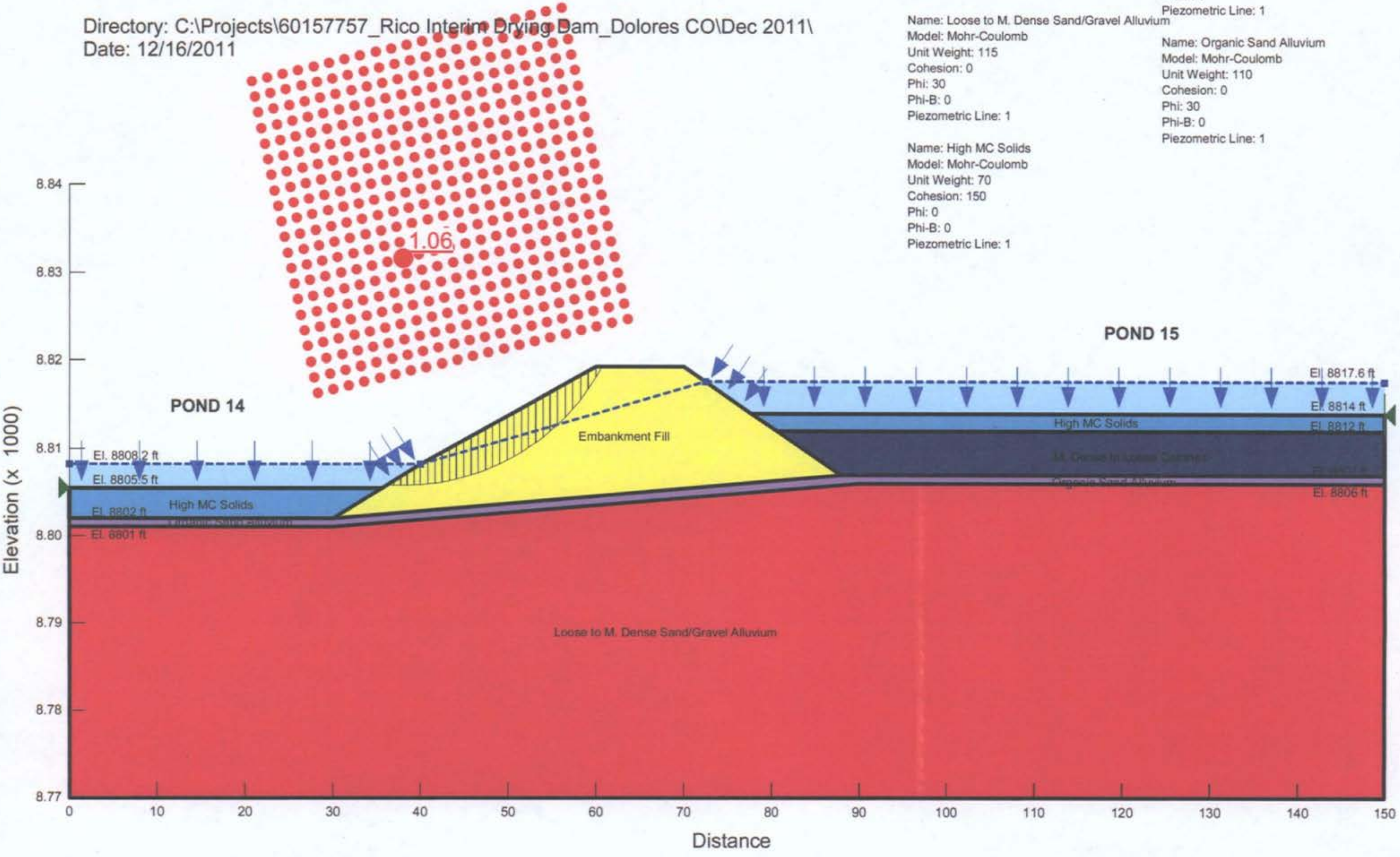
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Organic Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 14/15
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/16/2011

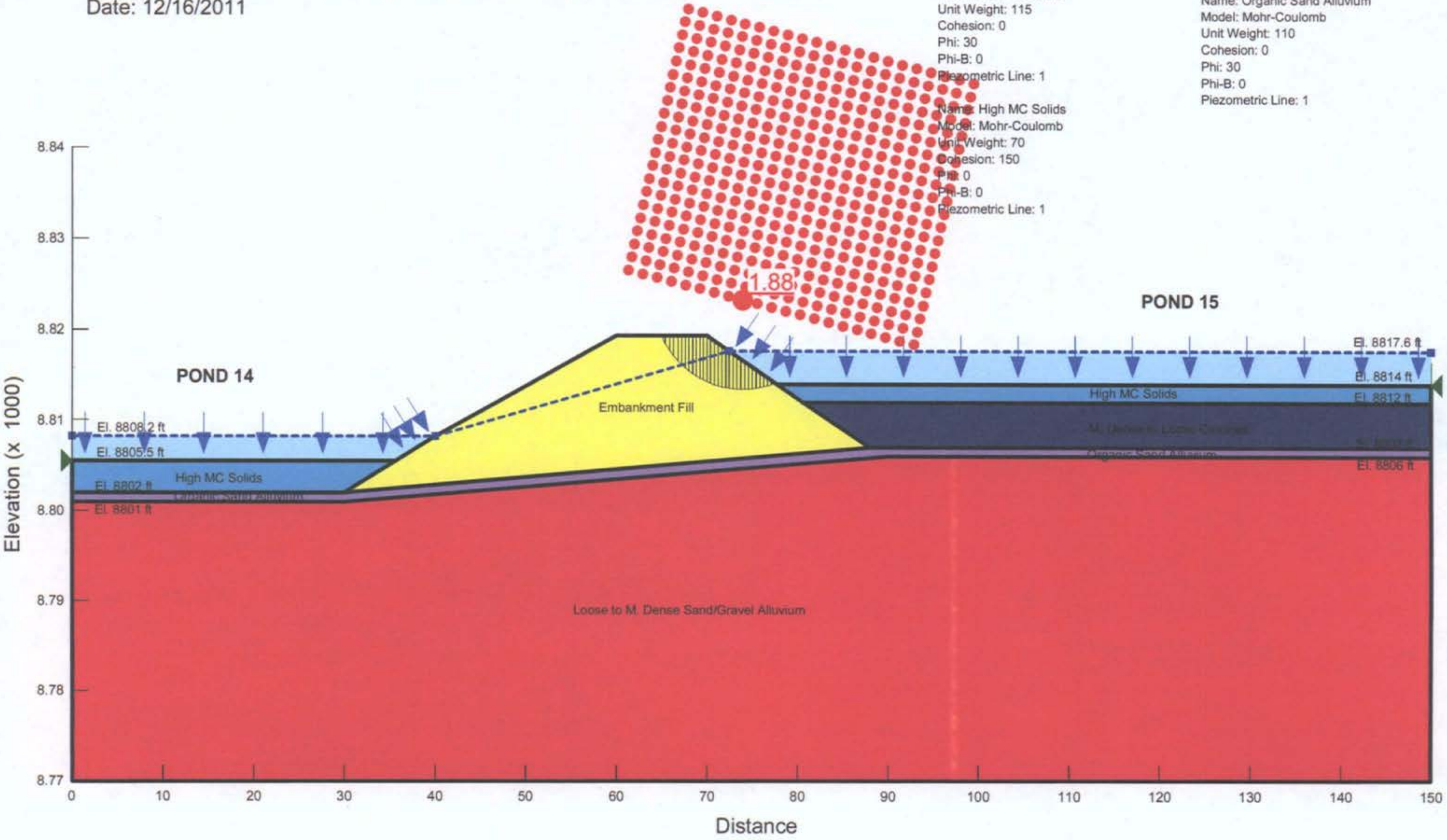
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Organic Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 14/15
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/16/2011

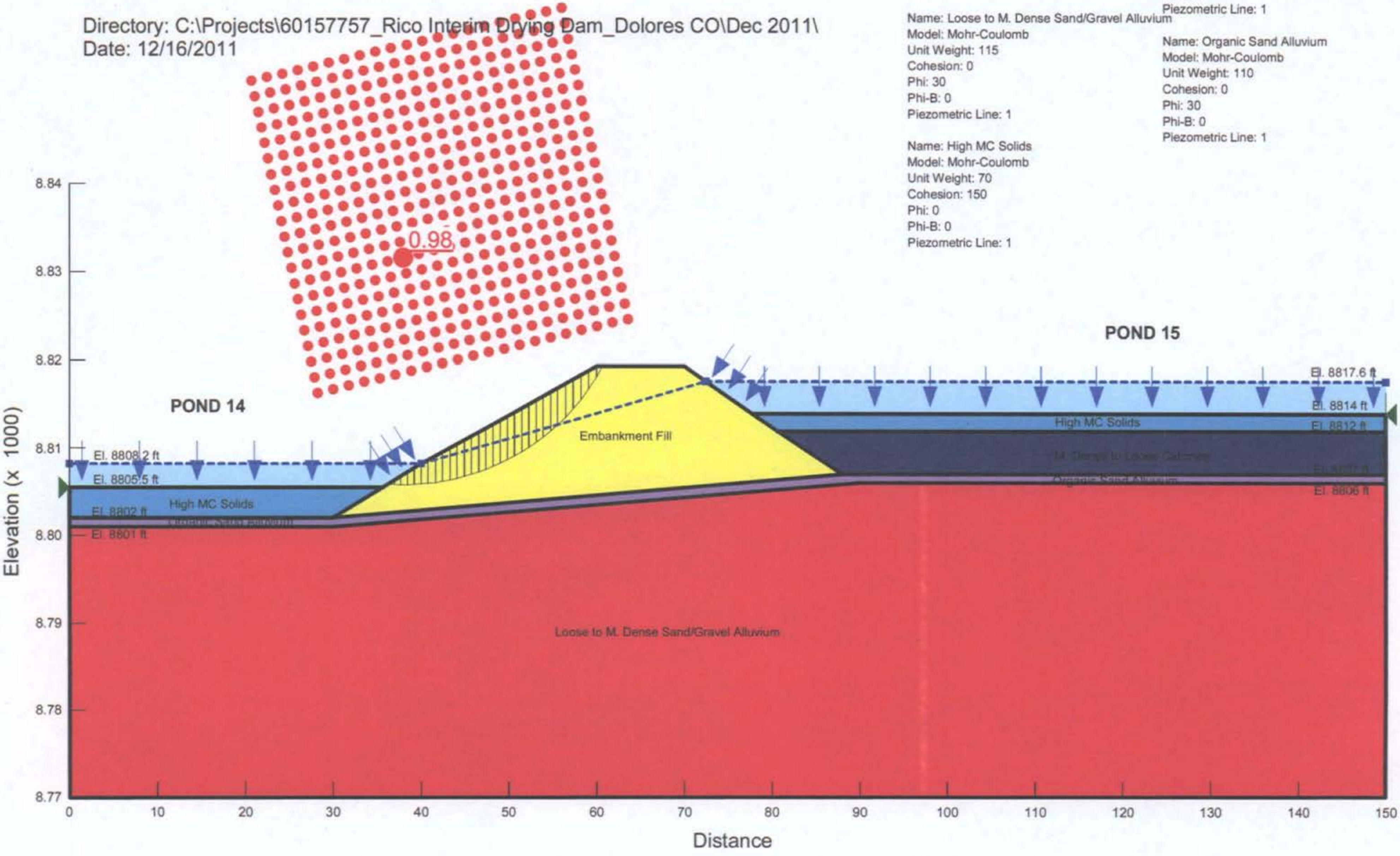
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Organic Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 14/15
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

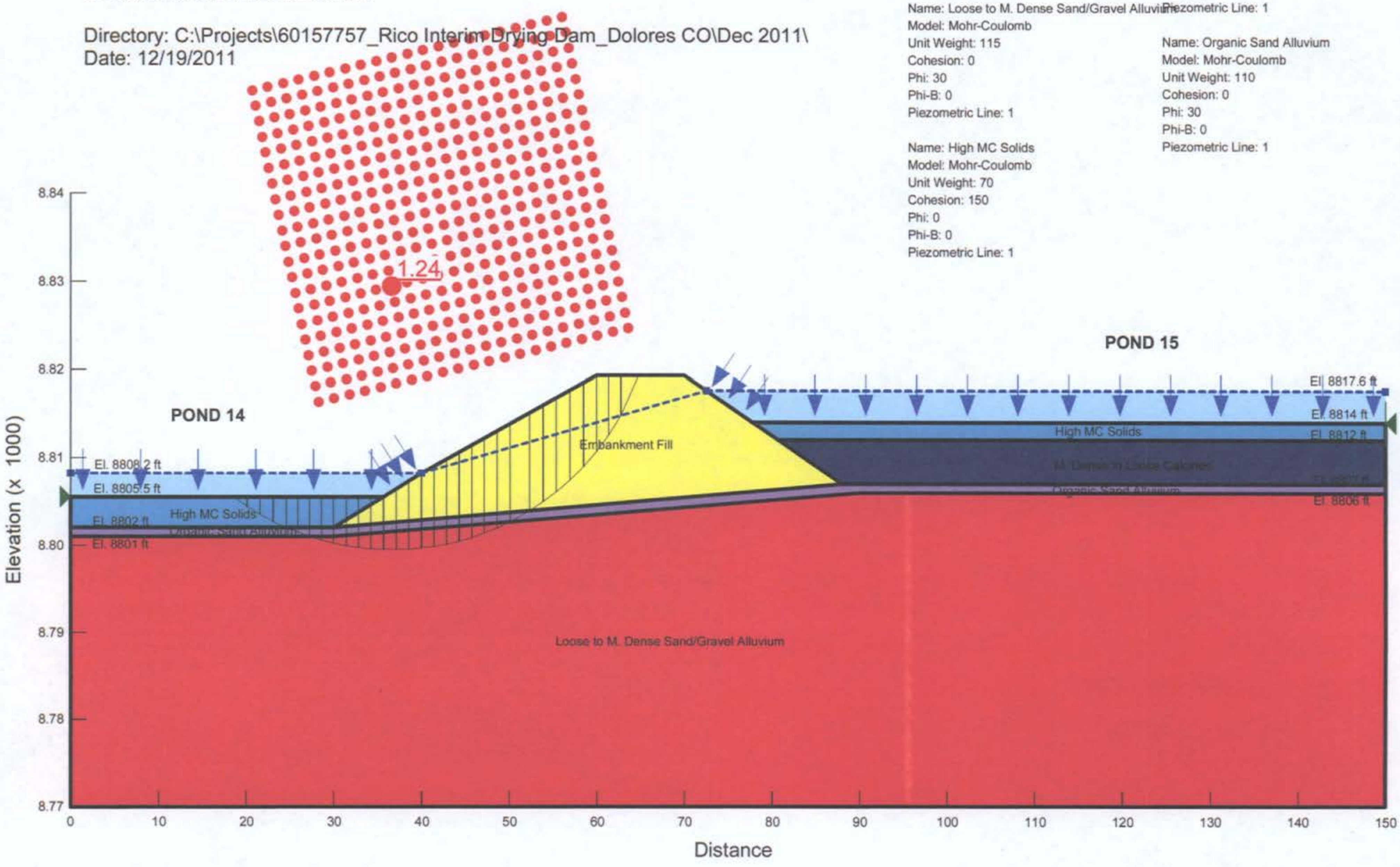
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand/Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: Organic Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 15/18
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/15/2011

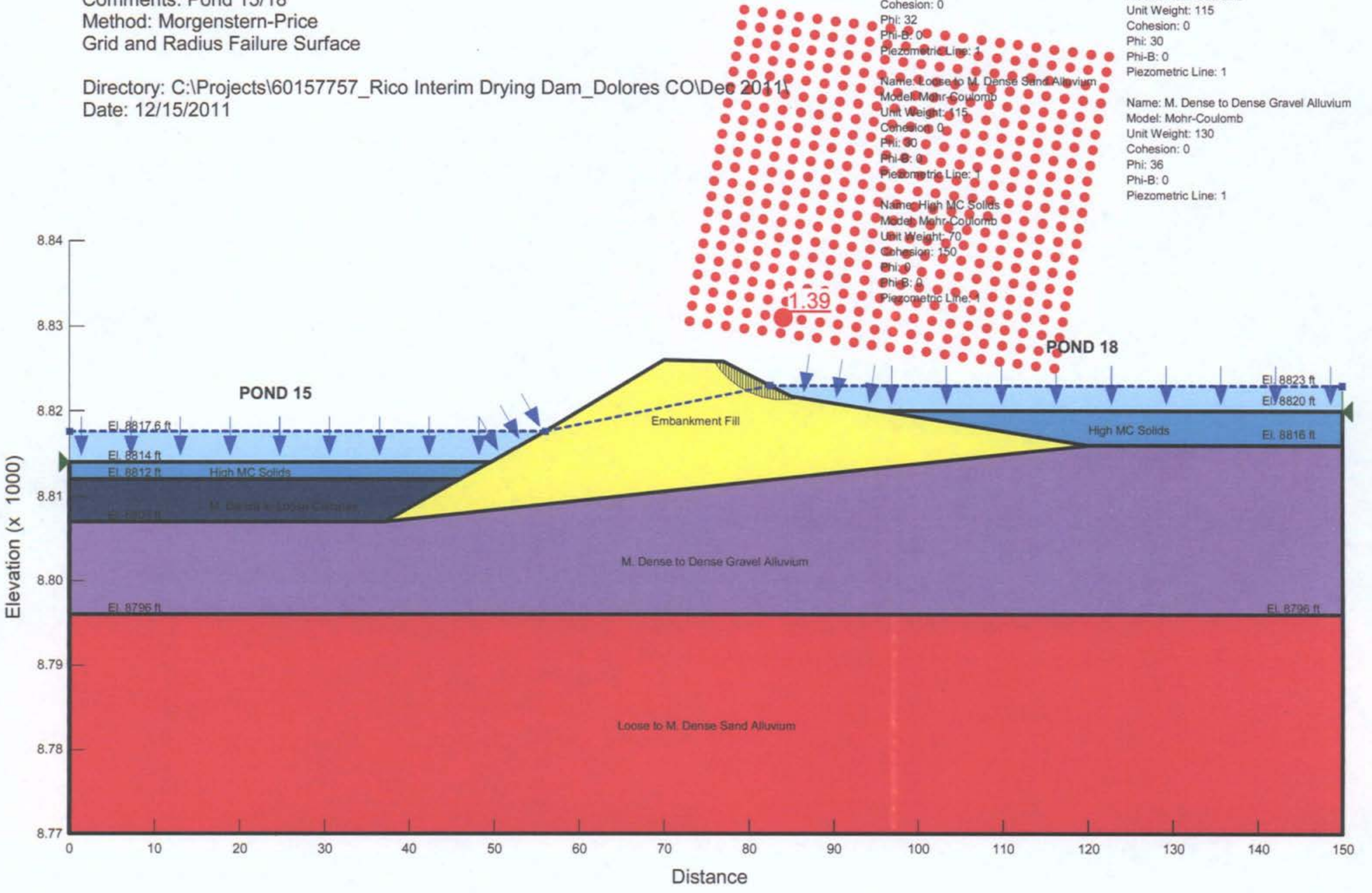
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 15/18
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/15/2011

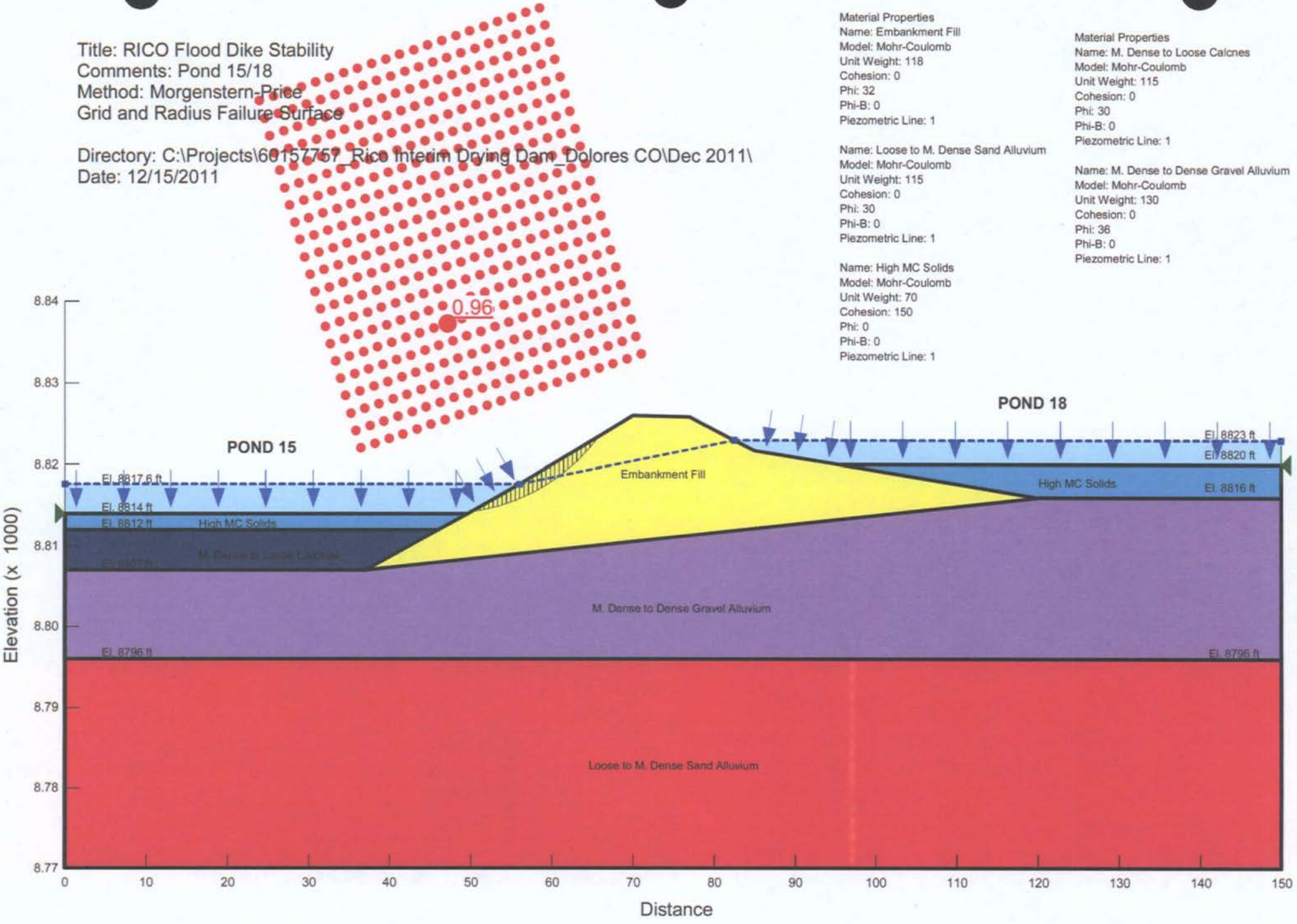
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 32
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 15/18
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

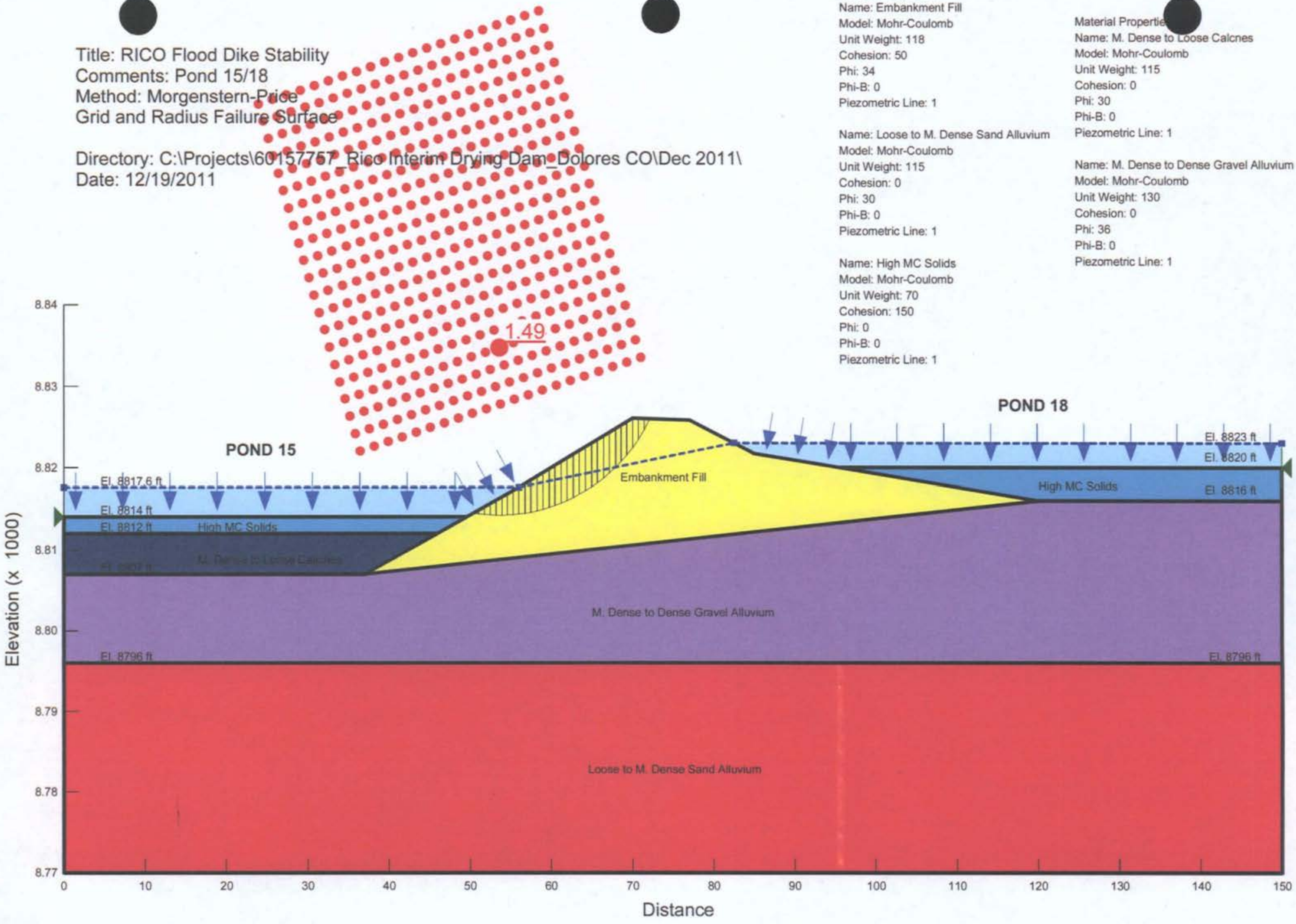
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 50
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcnes
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



Title: RICO Flood Dike Stability
Comments: Pond 15/18
Method: Morgenstern-Price
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/19/2011

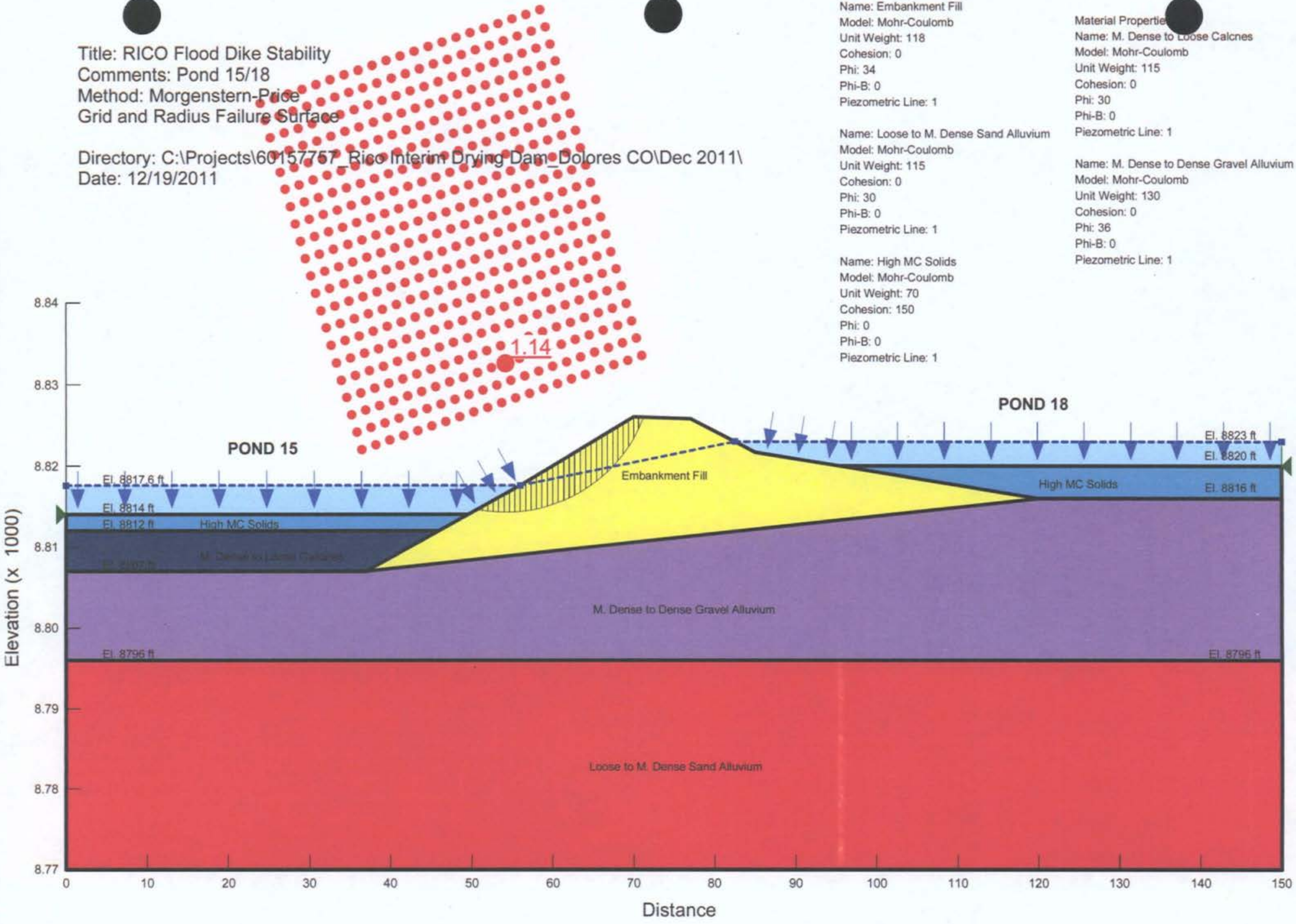
Material Properties
Name: Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 118
Cohesion: 0
Phi: 34
Phi-B: 0
Piezometric Line: 1

Name: Loose to M. Dense Sand Alluvium
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: High MC Solids
Model: Mohr-Coulomb
Unit Weight: 70
Cohesion: 150
Phi: 0
Phi-B: 0
Piezometric Line: 1

Material Properties
Name: M. Dense to Loose Calcines
Model: Mohr-Coulomb
Unit Weight: 115
Cohesion: 0
Phi: 30
Phi-B: 0
Piezometric Line: 1

Name: M. Dense to Dense Gravel Alluvium
Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 36
Phi-B: 0
Piezometric Line: 1



# APPENDIX C2
# SEEPAGE ANALYSIS OUTPUT

Title: RICO Flood Dike Stability
Comments: Pond 14/15
Method: Steady-State
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/20/2011

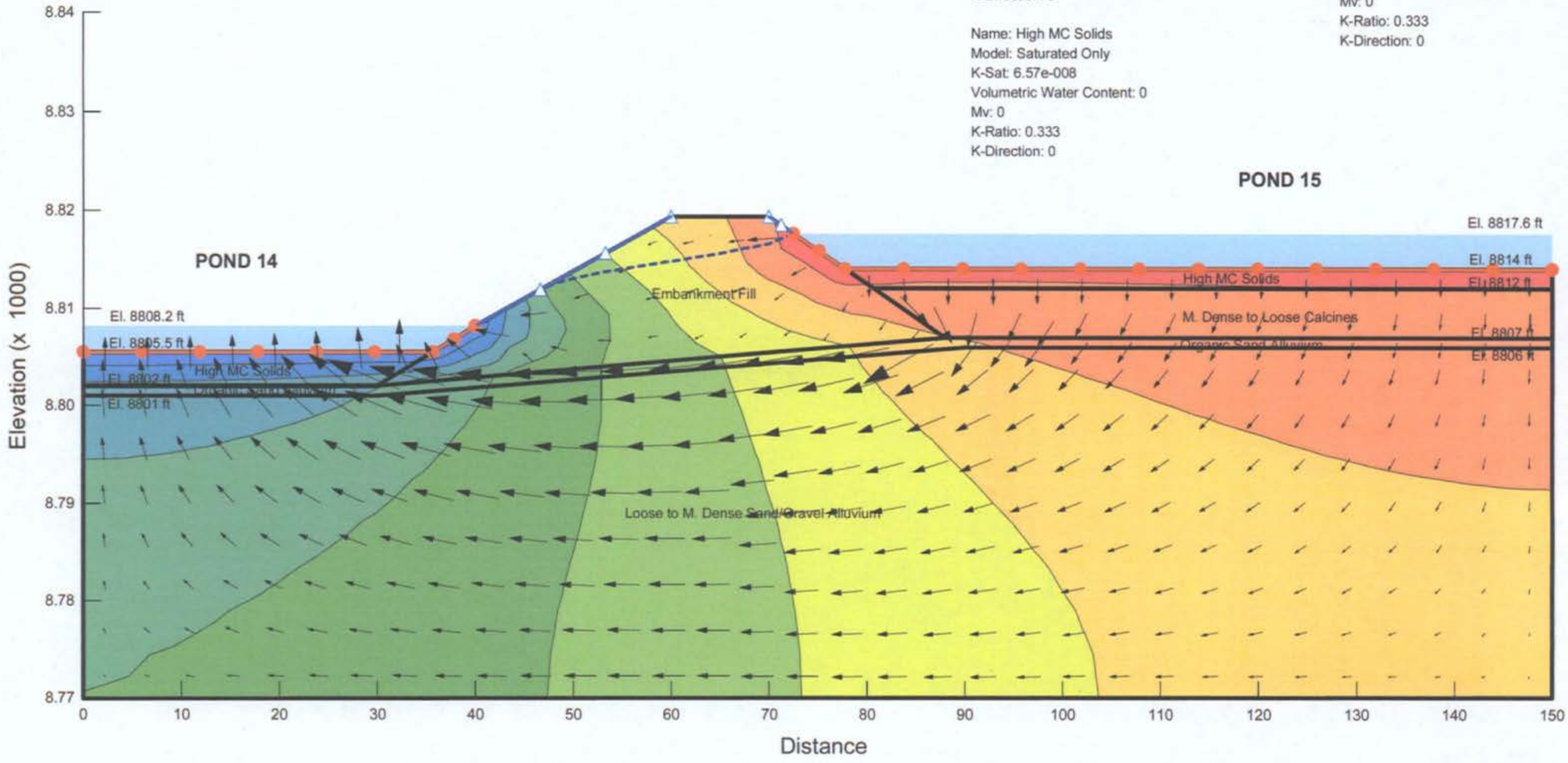
Material Properties
Name: Embankment Fill
Model: Saturated Only
K-Sat: 3.28e-008
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Loose to M. Dense Sand/Gravel Alluvium
Model: Saturated Only
K-Sat: 3.28e-007
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: High MC Solids
Model: Saturated Only
K-Sat: 6.57e-008
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Material Properties
Name: M. Dense to Loose Calcnes
Model: Saturated Only
K-Sat: 3.28e-007
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Organic Sand Alluvium
Model: Saturated Only
K-Sat: 3.28e-007
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0



Title: RICO Flood Dike Stability
Comments: Pond 15/18
Method: Steady-State
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Dec 2011\
Date: 12/20/2011

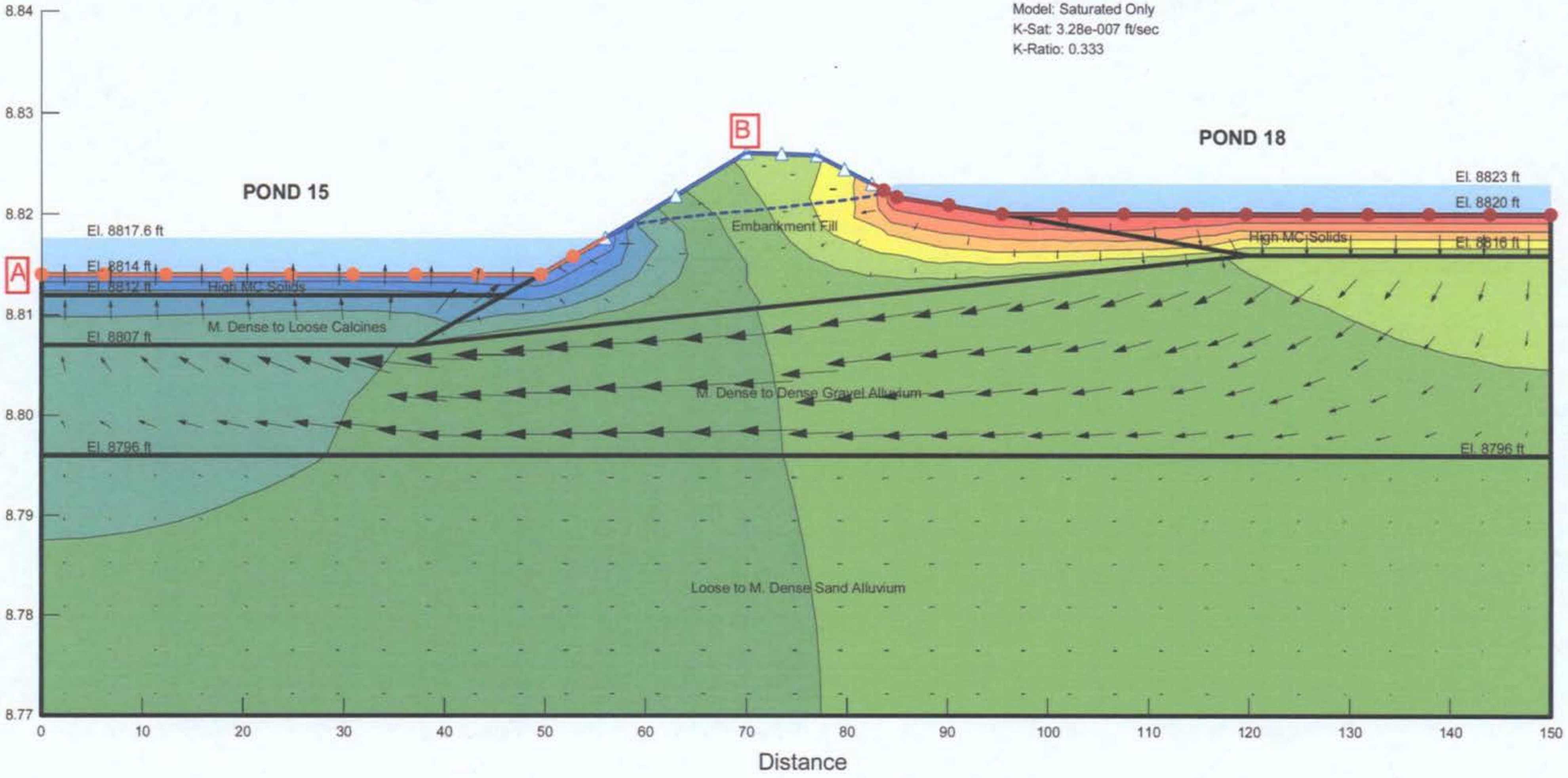
Material Properties
Name: Embankment Fill
Model: Saturated Only
K-Sat: 3.28e-008 ft/sec
K-Ratio: 0.333

Name: High MC Solids
Model: Saturated Only
K-Sat: 6.57e-008 ft/sec
K-Ratio: 0.333

Name: M. Dense to Loose Calcnes
Model: Saturated Only
K-Sat: 3.28e-007 ft/sec
K-Ratio: 0.333

Material Properties
Name: M. Dense to Dense Gravel Alluvium
Model: Saturated Only
K-Sat: 3.28e-006 ft/sec
K-Ratio: 0.333

Name: Loose to M. Dense Sand Alluvium
Model: Saturated Only
K-Sat: 3.28e-007 ft/sec
K-Ratio: 0.333



Title: RICO Interim Drying Facility Dike Stability
Comments: Flood Dike Station Sta 23+25
Method: Steady-State
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 12/20/2011

Material Properties
Name: Embankment Fill
Model: Saturated Only
K-Sat: 3.28e-008
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Loose to Medium Dense Sand/Gravel Alluvium
Model: Saturated Only
K-Sat: 3.28e-006
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: High MC Solids
Model: Saturated Only
K-Sat: 6.57e-008
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Material Properties
Name: Rip Rap
Model: Saturated Only
K-Sat: 0.0328
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Very Dense Cobble Alluvium
Model: Saturated Only
K-Sat: 3.28e-006
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Title: RICO Interim Drying Facility Dike Stability
Comments: Flood Dike Station Sta 32+00
Method: Steady-State
Grid and Radius Failure Surface

Directory: C:\Projects\60157757_Rico Interim Drying Dam_Dolores CO\Nov 2011\
Date: 12/20/2011

Model: Saturated Only
K-Sat: 3.28e-008
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

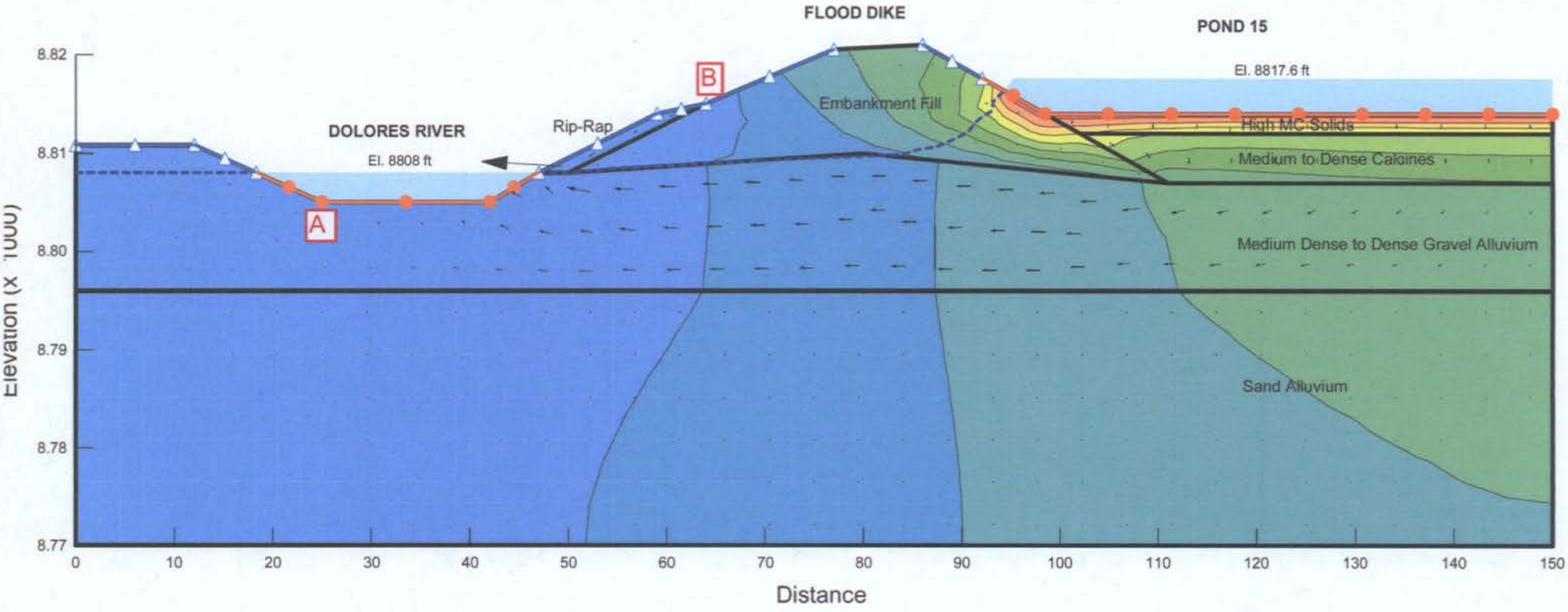
Name: High MC Solids
Model: Saturated Only
K-Sat: 6.57e-008
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Rip Rap
Model: Saturated Only
K-Sat: 0.0328
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

K-Sat: 3.28e-006
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Medium to Loose Calcines
Model: Saturated Only
K-Sat: 3.28e-007
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0

Name: Sand Alluvium
Model: Saturated Only
K-Sat: 3.28e-007
Volumetric Water Content: 0
Mv: 0
K-Ratio: 0.333
K-Direction: 0



PART D

# PART D

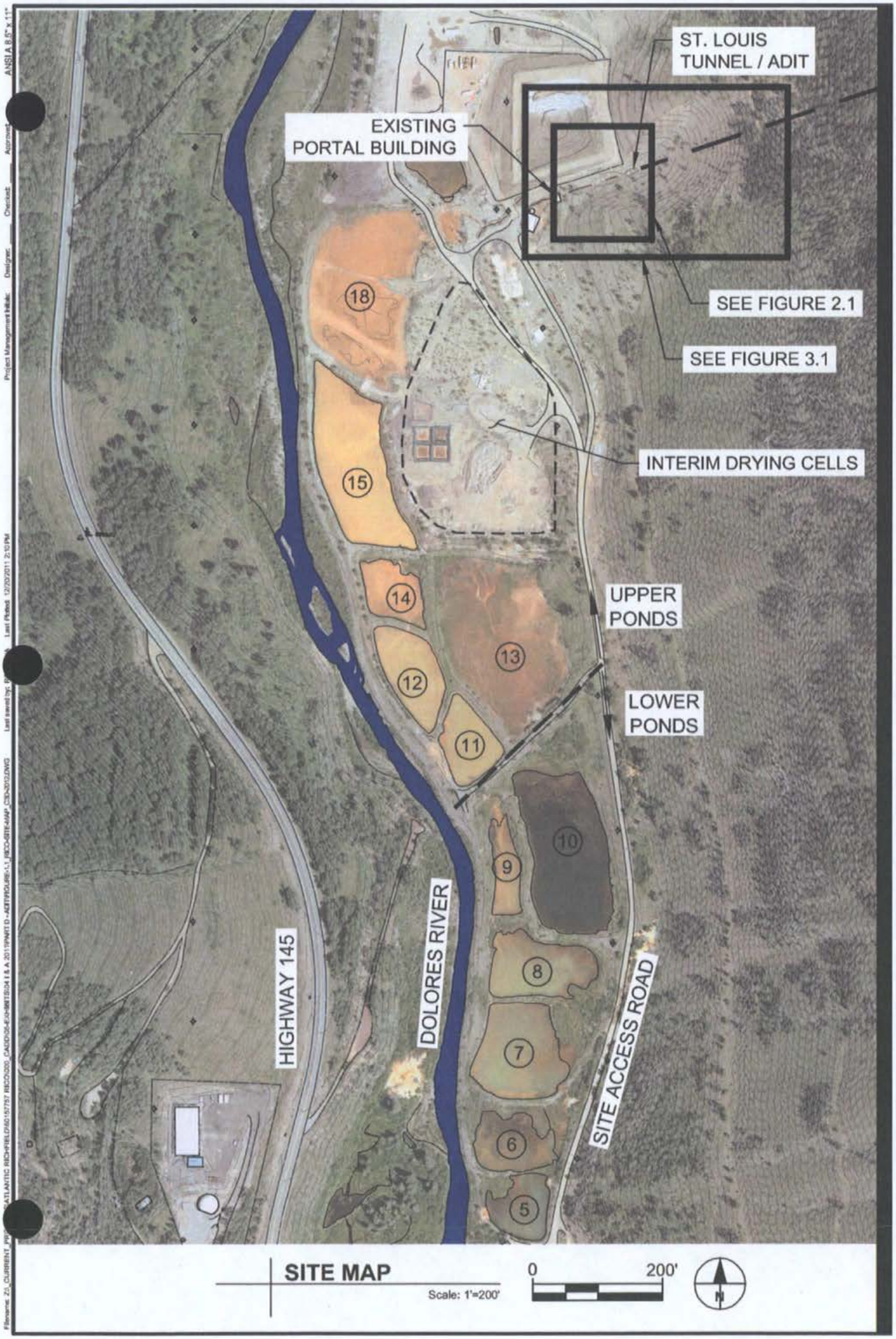
# TABLES

**Table 4.1** – Drill Hole BAH-01 Drilling Intercept Summary

| **Drilling Interval (feet)** | **Material Description** | **Interpretation** |
|---|---|---|
| 0 - 210 | Variable zones of soil with fragments of rock ranging from gravel to boulder size. | Colluvium |
| 210 - 240 | Interbedded sequence of fine-grained sandstone and siltstone with local shear zones and clay gouge. | Bedrock - Lower Hermosa Formation |
| 240 - 252 | Void | St. Louis Tunnel |

**Table 4.2** – Drill Hole BAH-01 Drilling, Casing and Sampling Methodology Summary

| **Interval (feet)** | **Hole Diameter (inches)** | **Casing Advance Method** | **Casing Type in Completed Boring** | **Casing Inner Diameter (inches)** | **Sampling Type** | **Material** |
|---|---|---|---|---|---|---|
| 0 – 147 | 4.5 | HWT w/ Tricone Bit | HWT | 4.0 | Drill Cuttings | Colluvium |
| 147 – 186 | 4.5 | HWT w/ casing shoe | HWT | 3.9 | HQ Coring<br>(Intermittent sampling) | Colluvium |
| 186 - 210 | 3.8 | HQ w/ casing shoe | HQ | 3.1 | HQ3 Core (186-205') (intermittent sampling)<br>NQ Coring (205-210')<br>(continuous sampling) | Colluvium |
| 210 - 252 | 3.0 | Open hole | None | - | NQ Coring<br>(continuous sampling) | Bedrock |



# RICO-ARGENTINE SITE - OU01

SITE MAP

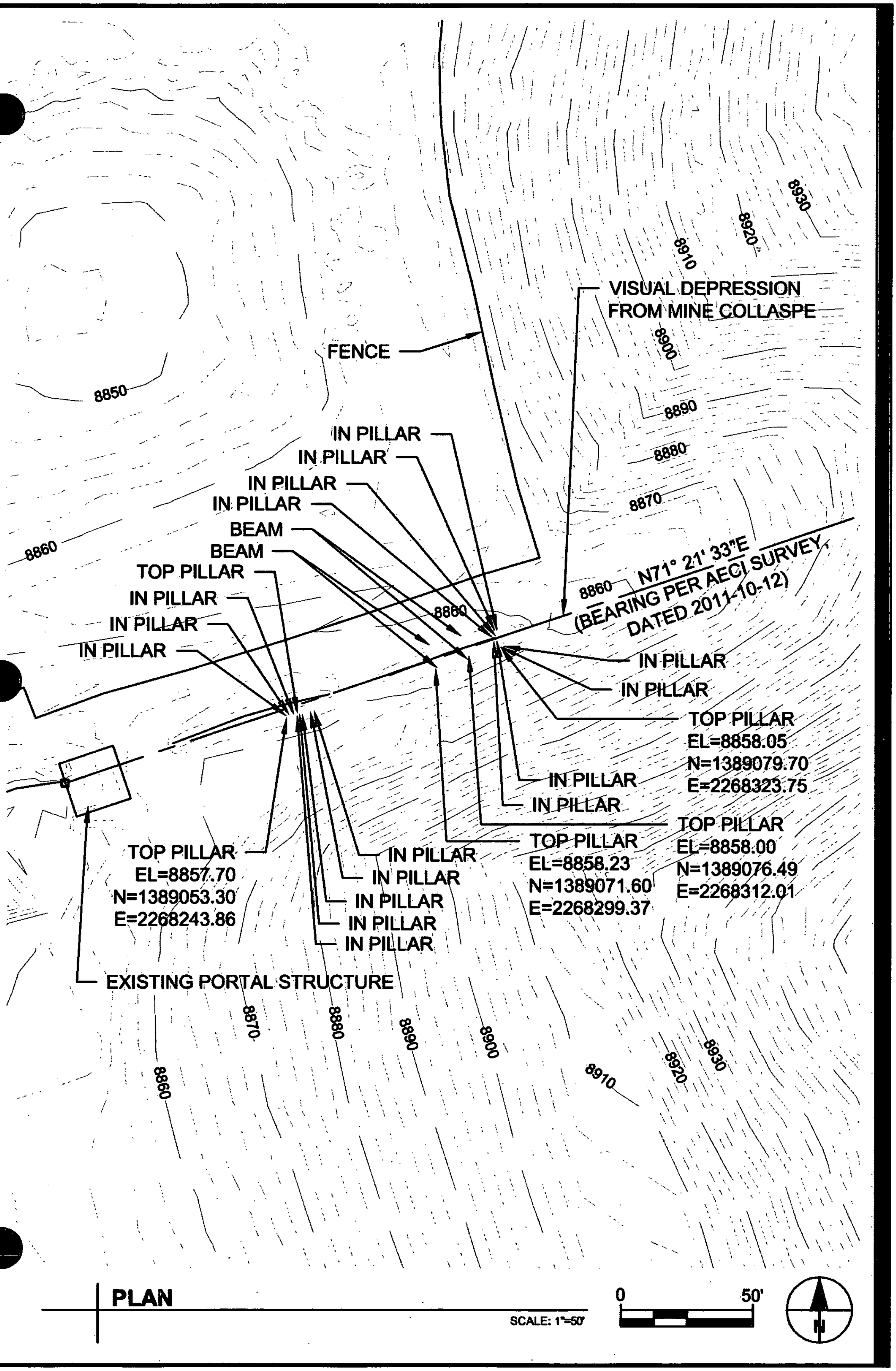
FIGURE 1.1

AECOM

60157757

Filename: Z0_CURRENT_PR ATLANTIC RICHFIELD\60157757 RICO\500_CADD\05-EXHIBITS\04 I & A 2011\PART D - ADIT\FIGURE-1.1_RICO-SITE-MAP_C3D-2012.DWG Last saved by: Last Plotted: 12/20/2011 2:10 PM Project Management Initials: Designer: Checked: Approved: ANSI A 8.5" x 11"

# FIGURES



# RICO-ARGENTINE SITE - OU01

SURVEY OF COLLAPSED ADIT AREA

FIGURE 2.1

AECOM

60157757

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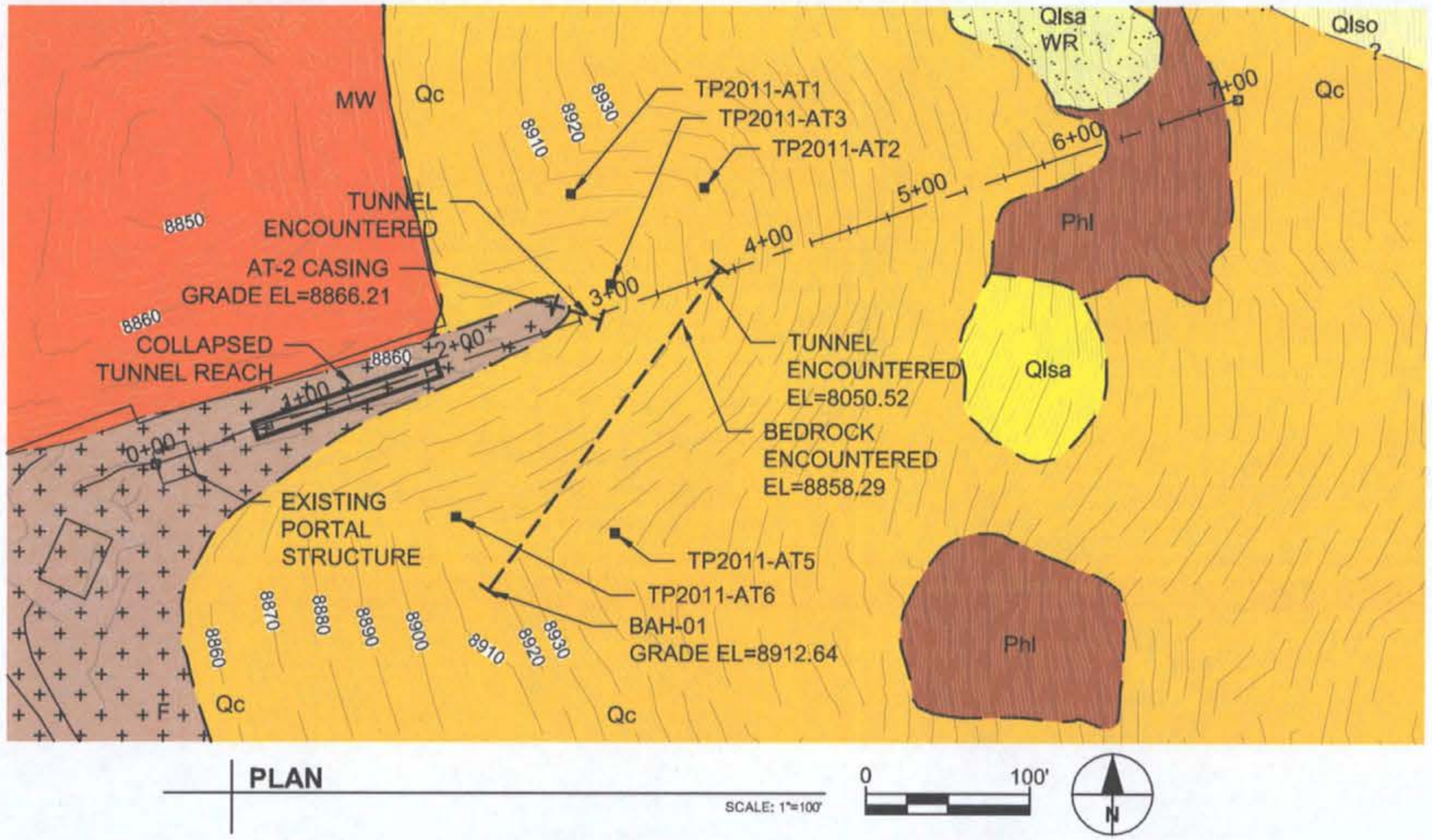
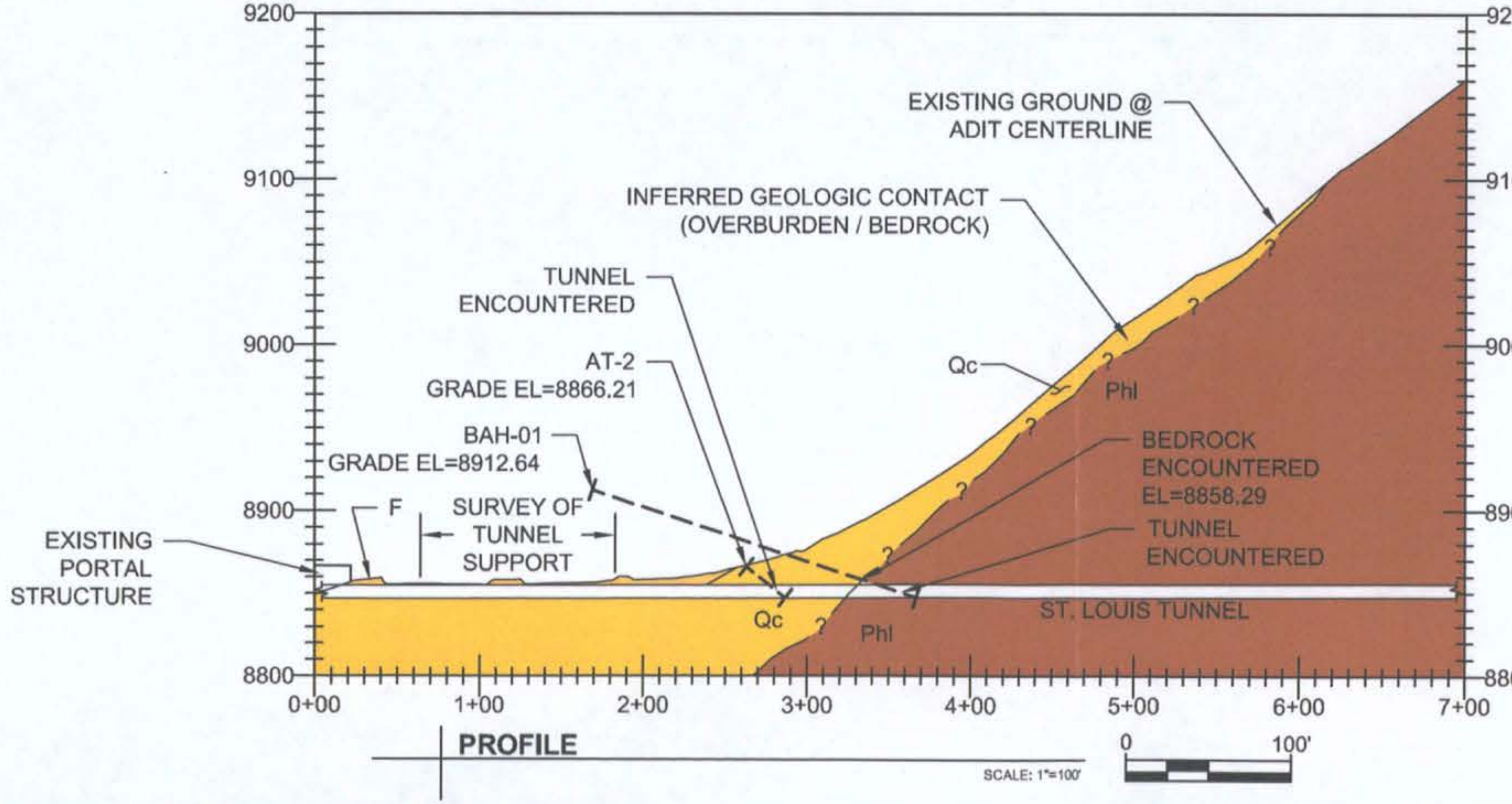
ANSI A 8.5" x 11"



LEGEND:
- ▨ FILL
- 🟥 MINE WASTE
- ▨ WASTE ROCK
- 🟫 Phl
- 🟧 Qc
- ☐ Qlso
- 🟨 Qlsa

(SEE DETAILED EXPLANATION ON FIGURE 3.1, PART A)



**AECOM**

60157757

# RICO-ARGENTINE SITE-OU01

ADIT SURVEY PLAN & PROFILE

FIGURE 3.1

Last Plotted: 12/20/2011 4:28 PM
Project Management Initials: Designer: Checked: Approved: ANSI B 11" x 17"

# PHOTOS

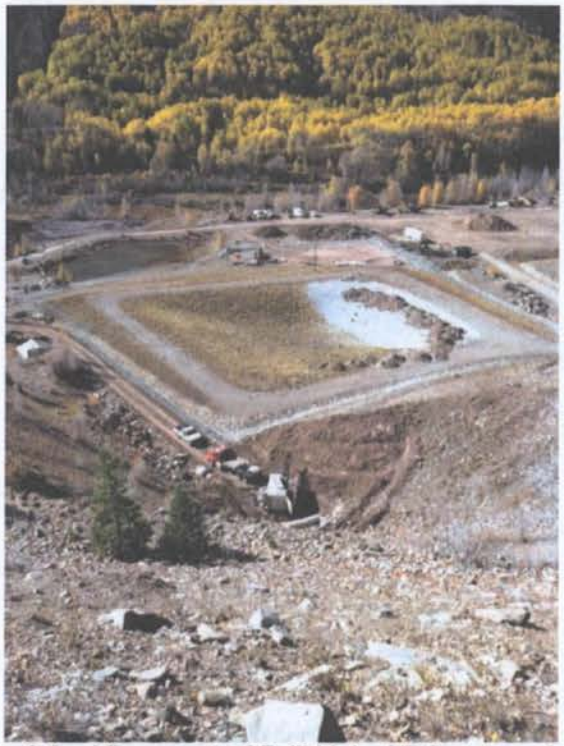


**Photo 4.1** – View west of Drill Hole AT-2 at toe of slope

**Photo 4.2** – Concrete retaining blocks stacked up-slope of Drill Hole AT-2 to protect crew from rock-fall

**Photo 4.3** – Angle hole drilling for Drill Hole AT-2

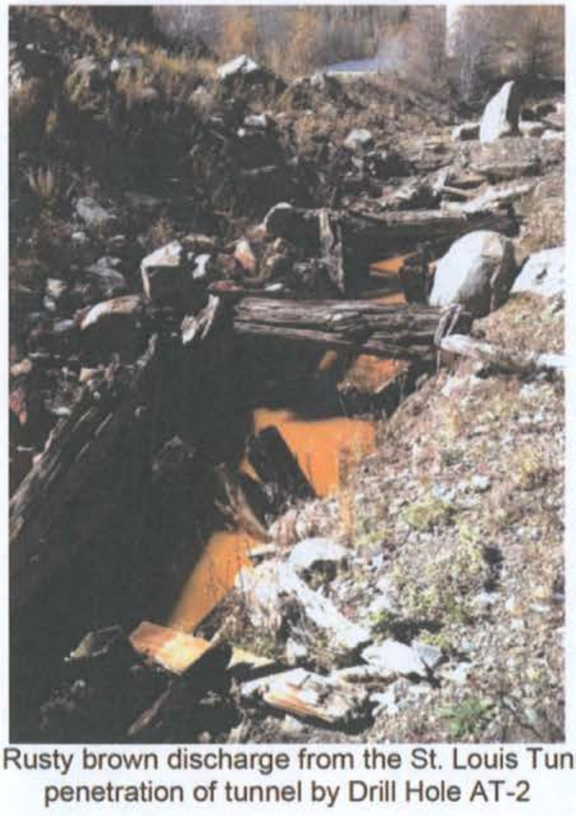


**Photo 4.4** – Rusty brown discharge from the St. Louis Tunnel following penetration of tunnel by Drill Hole AT-2

**Photo 4.5** – Red brown sediment retrieved from tunnel on green pump screen at Drill Hole AT-2

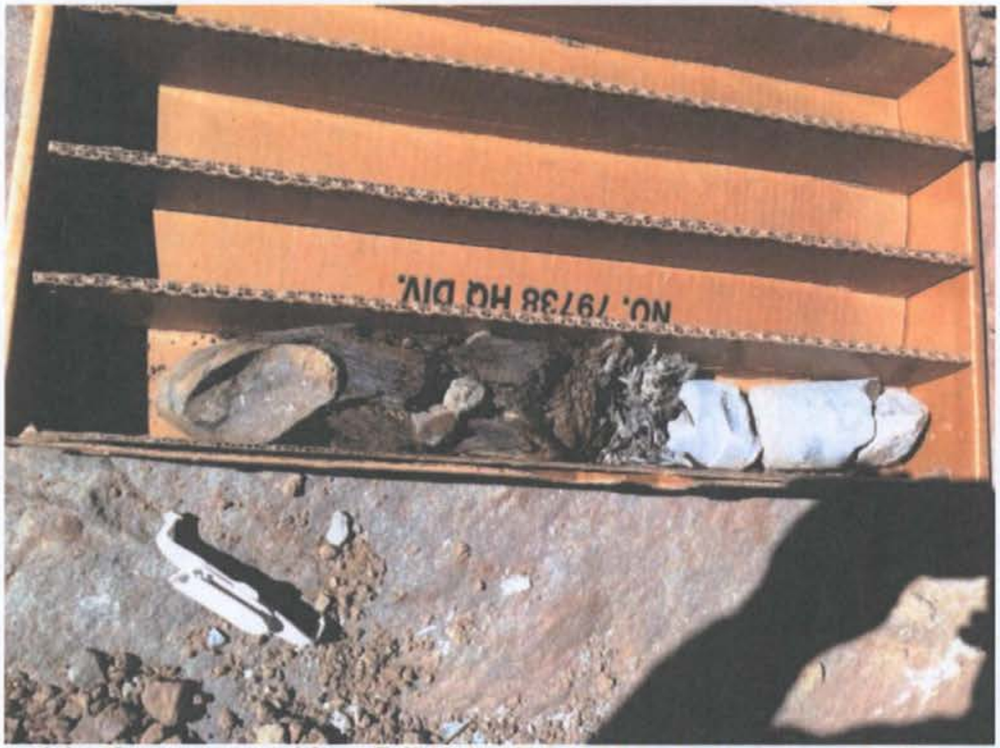


**Photo 4.6** – Core recovered from Drill Hole AT-2 at 35 feet included metal railroad track, wooden railroad tie, and six inches of latite porphyry

**Photo 4.7** – Samples of mine discharge water and sludges / sediment collected from Drill Hole AT-2

**Photo 4.8** – View north showing drilling set-up at Drill Hole BAH-01

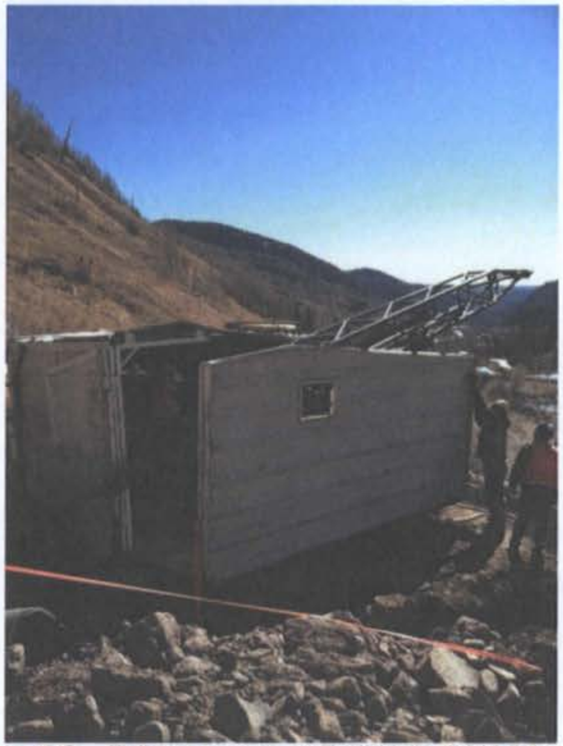


**Photo 4.9** – Drilling set-up at Drill Hole BAH-01; note sub-horizontal orientation of drill pipe

**Photo 4.10** – Lined mud pit, water storage tank, and drill rig housing at Drill Hole BAH-01

**Photo 4.11** – First bedrock (fine-grained sandstone) encountered in Drill Hole BAH-01 at angled depth of 210 to 215 feet

**Photo 4.12** – Red coloration detected in St. Louis Tunnel discharge after BAH-01 penetrated a void at 240 to 252 feet (inferred as the St. Louis Tunnel)

# APPENDICES

## Appendix D1 – Geochemical Laboratory Testing Results

# APPENDIX D1

# GEOCHEMICAL LABORATORY TESTING RESULTS

## ANALYTICAL RESULTS

Project: RICO WATER SAMPLING
Pace Project No.: 60108677

**Sample: GW-AT-2 WATER** **Lab ID: 60108677013** Collected: 10/21/11 13:30 Received: 10/22/11 09:30 Matrix: Water

Comments: • The samples were received outside of required temperature range. Analysis was completed upon client approval.

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **200.8 MET ICPMS** | Analytical Method: EPA 200.8 | | | | | | | |
| Aluminum | **638000** | ug/L | 200 | 50 | 10/28/11 08:24 | 11/03/11 14:18 | 7429-90-5 | |
| Antimony | ND | ug/L | 2.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-36-0 | |
| Arsenic | **31.2** | ug/L | 2.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-38-2 | |
| Barium | **829** | ug/L | 1.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-39-3 | |
| Beryllium | **588** | ug/L | 1.0 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-41-7 | |
| Cadmium | **581** | ug/L | 0.40 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-43-9 | |
| Calcium | **651000** | ug/L | 1000 | 50 | 10/28/11 08:24 | 11/04/11 11:12 | 7440-70-2 | |
| Chromium | **454** | ug/L | 2.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-47-3 | |
| Copper | **138000** | ug/L | 250 | 500 | 10/28/11 08:24 | 11/04/11 11:16 | 7440-50-8 | |
| Iron | **3890000** | ug/L | 25000 | 500 | 10/28/11 08:24 | 11/04/11 11:16 | 7439-89-6 | |
| Lead | **12400** | ug/L | 5.0 | 50 | 10/28/11 08:24 | 11/03/11 14:18 | 7439-92-1 | |
| Magnesium | **57400** | ug/L | 25.0 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7439-95-4 | |
| Manganese | **108000** | ug/L | 250 | 500 | 10/28/11 08:24 | 11/04/11 11:16 | 7439-96-5 | |
| Nickel | **601** | ug/L | 2.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-02-0 | |
| Potassium | **9610** | ug/L | 100 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-09-7 | |
| Selenium | **58.1** | ug/L | 2.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7782-49-2 | |
| [illegible]ilver | **8.6** | ug/L | 2.5 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-22-4 | |
| [illegible]dium | **6080** | ug/L | 250 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-23-5 | |
| Thallium | **1.6** | ug/L | 0.50 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-28-0 | |
| Total Hardness by 2340B | **1860000** | ug/L | 3550 | 50 | 10/28/11 08:24 | 11/04/11 11:12 | | |
| Vanadium | **0.98** | ug/L | 0.50 | 5 | 10/28/11 08:24 | 11/03/11 14:14 | 7440-62-2 | |
| Zinc | **376000** | ug/L | 2500 | 500 | 10/28/11 08:24 | 11/04/11 11:16 | 7440-66-6 | |
| **245.1 Mercury** | Analytical Method: EPA 245.1 | | | | | | | |
| Mercury | **1.4** | ug/L | 0.20 | 1 | 10/27/11 13:03 | 10/28/11 14:47 | 7439-97-6 | |

## ANALYTICAL RESULTS

|  |  |
|---|---|
| Project: | RICO WATER SAMPLING |
| Pace Project No.: | 60108677 |

**Sample: GW-AT-2 SOIL** **Lab ID: 60108677022** Collected: 10/21/11 13:30 Received: 10/22/11 09:30 Matrix: Solid

***Results reported on a "wet-weight" basis***

Comments: • The samples were received outside of required temperature range. Analysis was completed upon client approval.

| Parameters | Results | Units | Report Limit | DF | Prepared | Analyzed | CAS No. | Qual |
|---|---|---|---|---|---|---|---|---|
| **6020 MET ICPMS** | Analytical Method: EPA 6020 | | | | | | | |
| Aluminum | **1380** | mg/kg | 3.8 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7429-90-5 | M6 |
| Antimony | ND | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-36-0 | |
| Arsenic | **1.8** | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-38-2 | |
| Barium | **3.9** | mg/kg | 0.29 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-39-3 | |
| Beryllium | **0.75** | mg/kg | 0.19 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-41-7 | |
| Cadmium | **2.2** | mg/kg | 0.077 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-43-9 | |
| Calcium | **770** | mg/kg | 48.1 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-70-2 | M6 |
| Chromium | **1.5** | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-47-3 | |
| Copper | **198** | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-50-8 | M6 |
| Iron | **11300** | mg/kg | 48.1 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7439-89-6 | M6 |
| Lead | **18.0** | mg/kg | 0.096 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7439-92-1 | |
| Magnesium | **427** | mg/kg | 4.8 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7439-95-4 | M6 |
| Manganese | **147** | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7439-96-5 | M6 |
| Nickel | **1.5** | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-02-0 | |
| Potassium | **138** | mg/kg | 48.1 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-09-7 | M6 |
| [illegible]elenium | ND | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7782-49-2 | |
| [illegible]er | ND | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-22-4 | |
| [illegible]odium | ND | mg/kg | 48.1 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-23-5 | |
| Thallium | **0.27** | mg/kg | 0.096 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-28-0 | |
| Vanadium | **0.70** | mg/kg | 0.48 | 20 | 11/01/11 08:57 | 11/04/11 00:20 | 7440-62-2 | |
| Zinc | **366** | mg/kg | 24.0 | 100 | 11/01/11 08:57 | 11/04/11 00:34 | 7440-66-6 | M6 |
| **7471 Mercury** | Analytical Method: EPA 7471 | | | | | | | |
| Mercury | ND | mg/kg | 0.020 | 1 | 11/01/11 09:03 | 11/02/11 11:00 | 7439-97-6 | |